GREATER SAGE-GROUSE AND THE ENDANGERED SPECIES ACT

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Upland Habitats, Game Birds and Wildlife

The United States Fish and Wildlife Service (The Service) has received numerous petitions to list greater sage-grouse as a threatened or endangered species under the US Endangered Species Act. In 2011, The Service issued a decision of warranted but precluded, meaning that threats to sage-grouse were thought to be sufficient to justify listing under ESA, however, more eminent threats to other species and a lack of sufficient funding would preclude the service from carrying out the listing. In this listing decision, The Service also determined that sage-grouse in the Bi-State Region of Nevada and California met the criteria for a distinct population segment (DPS), meaning that Bi-State sage-grouse may be considered independently for future listing. Here, I provide background information on ESA, and discuss the process that The Service will undertake in upcoming reviews of sage-grouse status.

IMPORTANCE OF VALLEY OAKS TO MIGRATORY SONGBIRDS
IN SACRAMENTO’S URBAN FOREST

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Conservation and Management of Songbirds

Urban development occupies over 375,000 ha (6%) of California’s Central Valley, and expansion continues to displace natural and agricultural habitats. The value of developed habitat to native wildlife and the characteristics that determine its value, however, remain little studied. Many neotropical migrant bird species are declining due to changes in climate and breeding, migratory, and wintering habitats. During 2010-2012, we surveyed migrating songbirds and measured tree canopy cover within 31 transects in Curtis Park, an older residential neighborhood in Sacramento, California, to evaluate the importance of native valley oaks (Quercus lobata) as foraging habitat for migrants. We detected 20 migrant species, but four comprised the bulk of observations: Black-throated Gray, Wilson’s, Orange-crowned, and Yellow Warblers. Migrant abundance was closely correlated with oak canopy measures, with migrants detected 10-20 times more frequently in areas with high valley oak canopy density than in similar areas lacking oaks. Direct observation also showed that foraging migrants strongly selected valley oak more than expected based its proportional canopy cover, and they underutilized non-native trees. Results suggest that protecting existing valley oaks and increasing their use in future urban forestry and landscape plantings in the Central Valley would provide substantial habitat benefits for migratory birds.

INTEGRATING SCIENCE INTO DECISIONS: CLIMATE CHANGE/LAND USE CHANGE SCENARIOS FOR ASSESSING THREATS TO ECOSYSTEM SERVICES ON CALIFORNIA RANGELANDS

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Grazing, Agriculture and Wildlife Conservation

There are 18 million acres of rangelands in the California Central Valley and the interior Coast Range, most of which are privately owned and managed for livestock production. These ranches provide habitat for 75 threatened and endangered species, and generate multiple ecosystem services. As part of the California Landscape Conservation Cooperative, we developed spatially-explicit integrated climate change/land use change scenarios
for the Central Valley and chaparral and oak woodland eco-regions out to 2100 based IPCC Scenarios A1B, A2, and B1. Scenario storylines relevant to California rangelands were developed with input from the ranching community, local experts on land use change, and historical land use data. Modeling was conducted through the USGS National LandCarbon Project. We integrated downscaled California climate projections at 270 meters and related hydrologic model outputs on climatic water deficit, runoff and recharge with the FORE-SCE land use change model to produce maps of possible future changes to 14 land use/land cover classes. Model outputs identified how alternative future development patterns, extent of irrigated agriculture, and climatic conditions could potentially threaten ecosystem services on rangelands (wildlife habitat, groundwater recharge and carbon sequestration) and the relative economic costs and benefits associated with those changes.

PAYMENTS FOR ECOSYSTEM SERVICES: A CALIFORNIA RANCHER PERSPECTIVE

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Grazing, Agriculture and Wildlife Conservation

A survey of ranchers in the Central Valley of California was taken in 2010 to gather information on demographics, rancher’s knowledge and attitudes towards current conservation programs, their interest in participating in Payments for Ecosystem Services (PES) programs, and what attributes of a potential PES are most important to ranchers. The marginal profitability of most ranching operations suggests a need for the implementation of conservation programs that incentivize the provision of ecosystem services and allow ranchers to avoid further loss and fragmentation of these important ecosystems. Ranchers in California are interested in participating in PES programs that involve improving wildlife habitat, ecological restoration and increasing land productivity. Concerns about government restrictions and excessive bureaucracy hinder rancher participation in conservation programs. According to our choice-based conjoint analysis all three attributes (contract length, payment, and administering agency) affect rancher’s decisions to enter into a PES program. Ranchers in California show a preference for shorter contract lengths, higher payments and a non-profit organization as an administrator. These data can be used to inform ranchers, environmental organizations and policy makers about potential PES programs and how they can be structured to achieve maximum environmental goals and enhance the sustainability of California privately owned rangelands.

CONSERVATION, DISTRIBUTION, AND POPULATION-SIZE OF THE NOW-DELISTED CALIFORNIA BROWN PELICAN

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Endangered Species Act Implementation: Successes and Challenges

Brown Pelican conservation in western North America (encompassing California Brown Pelicans [CABRPE], Pelecanus occidentalis californicus) involves two approaches: (1) in the US, largely single-species approaches (MBTA/ESA), encompassing augmenting the population through concepts of umbrella, flagship, or iconic species, and threatened habitat; and (2) in western Mexico, approaches centered on islands/ecosystems, encompassing indicator species for ecological health monitoring. In the late-1960s, a severe population decline and depressed reproductive success occurred in the northern population segment, the Southern California Bight (SCB) Sub-Population; and the subspecies became endangered 1969-71. SCB breeding numbers were reduced by 90-95% by the late-1960s and reproduction was near zero-caused mostly by SCB contaminants. A Recovery Plan was approved in 1983. Significant efforts benefitting CABRPE in Mexico were established by 1978. After amelioration, slow SCB recovery began in 1974. Status-change proposals were developed from 1980 to 2006. In 2006, a complete survey of CABRPE range found a non-El Niño metapopulation of 70,700 ± 2,600 (SD) breeding
pairs. Little metapopulation change occurred in four decades south of SCB, but significant SCB improvements had occurred (12,000 ± 500 pairs). In 2009, after extensive review, the entire species was de-listed. Systematic post-delisting monitoring has continued only in the Gulf of California. Repeated endangerment remains a possibility because of new threats.

**GEODESIGN: WHERE SOLAR PANELS AND DESERT PAVEMENT MEET**

**Leslie Backus;** Chrysalis Biology; Bend, OR, 97702; 310-614-7994; lanius@rocketmail.com; and Kathy Simon (presenting)

**Renewable Energy and Wildlife – Managing a Balance**

The first step in designing a truly functional database and data management structure is to focus on your long term goals. Two pertinent questions to ask yourself: what is the bigger picture? And what are my goals? From there you can start answering, “How do I get there?” GeoDesign not only focuses on the creation of a database, but instead on how we can incorporate all of the elements of our project into the design of our database. How elements like schedule, target users, client products and spatial, and dynamic, datasets play a role in how we manage, produce and process our data.

**HOW BURROW CHOICE MAY INFLUENCE TRANSLOCATION DECISIONS**

**Leslie Backus;** Chrysalis Biology; Bend, OR, 97702; 310-614-7994; lanius@rocketmail.com; and Brenda Hanley (presenting)

**Renewable Energy and Wildlife – Managing a Balance**

Estimating desert tortoise *(Gopherus agassizii)* densities, as well as translocation, have become important components to many solar and wind projects within the Mojave Desert. Understanding how, or why, a tortoise chooses its burrow may play a compelling role in producing appropriate density estimates, and determining successful translocation sites. Do burrow types influence desert tortoise density estimates? Does an increase in commensal species influence burrow choice? Is a longer-lived burrow an attractant or a deterrent to a roaming tortoise? Exploring some of these questions, may help us find a path for increasing the success of managing pre- and post-translocated populations being influenced by wind and solar projects.

**SEARCHING FOR A BETTER WAY: ENVIRONMENTAL CHALLENGES OF DEVELOPING UTILITY-SCALE SOLAR PROJECTS IN HABITAT AREAS**

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**Renewable Energy and Wildlife – Managing a Balance**

First Solar has been working with the BLM, environmental groups, and agency and wildlife biologists for over 5 years to develop unique methods to meet the challenges of developing utility-scale solar energy projects in habitat areas. Such collaborations have resulted in better sited projects with fewer resource conflicts. But challenges remain and First Solar is committed to continued progress in avoiding sensitive resources, testing new soil preparation techniques, and continuing to innovate to meet both the challenges of providing sustainable renewable energy balanced with native resource protection.
POTENTIAL PATHWAYS FOR AVIAN NEST SURVIVAL RESPONSE TO CLIMATE CHANGE

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*Student Paper*

**Climate Change and Wildlife: Managing Moving Targets**

Some life history components may limit the resilience of bird populations to climate change. Nesting earlier in response to warmer springs may make nests more vulnerable to late spring cold events or higher predation risk. We studied the relative contribution of post-laying temperatures and lay date on nest survival of American Robin (*Turdus migratorius*), Black-headed Grosbeak (*Pheucticus melanocephalus*), and Mourning Dove (*Zenaida macroura*) at sites in northern Nevada. We recorded the clutch initiation dates and nest fate of 334 nests from 2009-2012. The study period covered two early and two late springs. Temperature data for multiple temporal scales were derived from local weather stations. We expected that nests initiated at moderate temperatures would provide the most favorable thermal conditions for nestlings, but would occur mid-season when predation risk was also moderately high. A strong abiotic influence emphasizes the importance of managing habitat in the future for thermal refugia, while limitations from trophic interactions suggest a need to regulate predator populations.

SOUTH DELTA FLOODPLAIN RESTORATION: NOT JUST FOR FISH!

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**Conservation and Management of Songbirds**

The San Joaquin River and its tributaries Old and Middle Rivers comprise the southern Sacramento-San Joaquin Delta. This area of the Delta is highly modified: it supports confined channels, rip-rapped tidal edges, and denuded levees. However, just upstream, on the main stem of the San Joaquin River, there exists evidence of the historic geomorphology including natural river meanders, gravel bars, and large, moderately-sized patches of mature riparian forest. The Bay Delta Conservation Plan, in coordination with local, regional, and federal levee maintenance agencies, will restore up to 10,000 acres of inundated floodplain and up to 5,000 acres of riparian. The restoration is expected to substantially improve habitat conditions for many rare, riparian species by expanding upon existing protected lands and providing connectivity to newly restored portions of the interior Delta. We will discuss the design and implementation plans for these large-scale restoration actions within the context of covered species’ needs, an altered hydrograph, ongoing agriculture within the levees, and flood management needs.

CITIZEN INVOLVEMENT IN THE U.S. ENDANGERED SPECIES ACT

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**Endangered Species Act Implementation: Successes and Challenges**

Under the Endangered Species Act, citizens can petition the U.S. Fish and Wildlife Service (FWS) to list any unprotected species and can independently use litigation to challenge any FWS listing decision. Critics have argued that these provisions interfere with the ability of FWS to prioritize scarce resources for species that most need protection, and that citizens use petitions and litigation to pursue “pretextual” listing of species to stop development projects. We compared the levels of biological threat faced by listed species whose listing process was initiated by petition, or whose listing process had been the subject of litigation, with species whose listing process was neither initiated by petition nor was the subject of litigation. We found that petitioned and/or litigated species faced higher levels of biological threat than species that were the subject of neither petitions nor litigation.
We did find that citizens were more likely to petition and litigate for the listing of species whose conservation would conflict with development. However, listed species whose conservation conflicts with development also face greater threat levels. Our results indicate that citizens may help improve the ESA listing process, at least in terms of identifying species that warrant protection under the Act.

**STATE POLICY STRATEGIES: DEVELOPING A CONSERVATION AND MITIGATION BANKING PROGRAM IN CALIFORNIA**

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*The Endangered Species Act, Conservation Banking and Related Tools for Mitigating Impacts to Wildlife*

In 2012, the Department, bank sponsors, policy experts and other stakeholders undertook an effort to create a State Conservation and Mitigation Banking Program in California. This presentation will describe the process, timeline and result of this effort.

**HOME RANGE AND SEASONAL MOVEMENTS IN A SOUTHERN POPULATION OF SOOTY GROUSE**

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*Upland Habitats, Game Birds and Wildlife*

The distance and altitudinal range of seasonal movements made by Sooty Grouse (*Dendragapus fuliginosus*) vary greatly by region, but have never been studied in the southern portion of the species range. I trapped 10 male and 4 female Sierra Sooty Grouse (*D. f. sierrae*) near Pinecrest, California, in 2007-2008, fitted them with necklace-mounted radio transmitters, and relocated them every ~10 days by homing. I analyzed location data for 8 males and 2 females that survived at least one full breeding cycle. Annual home ranges averaged 1,193.3 ha (49.7-2,732.2 ha) by minimum convex polygon methods and 748.1 ha (129.5-1,326.9 ha) by fixed kernel methods. Home range size did not differ between sexes. Five individuals (50%; 3 males and 2 females) moved seasonally between geographically distinct breeding, post-breeding, and wintering areas, whereas the other individuals remained in one area during two successive seasons. On average, wintering areas were slightly higher than breeding areas (2352.5 vs. 2247.7 m) but the difference (104.8 m) was insignificant (*t*<sub>0.05</sub>). The greatest altitudinal movement occurred between breeding and post-breeding areas, when individuals gained an average of 237 m elevation. They then descended an average of 132 m to wintering areas.

**CLIMATIC PROCESSES INFLUENCE THE POPULATION DYNAMICS OF A CANDIDATE SPECIES: GREATER SAGE-GROUSE IN THE GREAT BASIN**

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*Upland Habitats, Game Birds and Wildlife*

Greater sage-grouse are currently designated as a candidate for federal protection under the U.S. Endangered Species Act, following widespread declines in distribution and abundance across the species’ range. Using results from a ten-year study of sage-grouse in eastern Nevada, we examine the role that climatic variation plays in driving year-to-year dynamics of sage-grouse populations. Annual variation in precipitation and temperature, which are generally characterized by drought and non-drought conditions, play a central role in sage-grouse reproduction. Post-hatch survival of sage-grouse chicks to 45 days of age was positively associated with spring
precipitation, and survival was four times greater during the year of highest precipitation compared with the driest year. We also found suggestive evidence for a negative influence of drought on female nesting propensity and nest success. Collectively, the negative influence of drought conditions explains more than 80% of the annual variation in population-level recruitment. In contrast to reproduction, annual survival of adult female sage-grouse was constant despite the large fluctuations we observed in drought conditions. Sage-grouse demographics are tightly linked to water balance in sagebrush ecosystems, and any increase in drought frequency or magnitude may reduce the future viability of sage-grouse populations in the Great Basin.

**STATEWIDE DISTRIBUTION OF GOLDEN EAGLE NESTS IN NEVADA**

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Ecology and Management of Raptors

In 2011, the Great Basin Bird Observatory and Nevada Department of Wildlife conducted surveys to map and characterize as many of Nevada’s Golden Eagle nest sites as possible. The goal of this project was to provide Nevada’s BLM state office with information needed to better evaluate the potential impacts of proposed energy developments. We therefore concentrated our efforts within Nevada’s 47 million acres of BLM-managed land, which represents two-thirds of the state’s land area and contains most of its suitable nesting habitat. From March - October 2011, we searched over 14 million acres of suitable habitat for Golden Eagle nests, 2.1 million acres by helicopter and 11.9 million acres from the ground. Approximately 822,000 acres were searched using both methods, allowing comparison of their relative efficacy. Just over 1,000 confirmed, probable, or possible Golden Eagle nest sites were recorded during the 2011 surveys, and multiple nest site attributes were collected for each. Preliminary analysis indicates that the 2011 surveys greatly increased our knowledge of Golden Eagle nest site distribution in the southern half of Nevada and in large sections of northern Nevada. Comparison of aerial and ground survey results and analysis of nest site characteristics and habitat will also be discussed.

**ENERGY AVAILABLE FOR SHOREBIRDS FROM BENTHIC MACROINVERTEBRATES IN SUPRATIDAL MANAGED PONDS IN SOUTH SAN FRANCISCO BAY**

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Ecology and Management of Shorebirds

Whereas intertidal mudflats provide key prey resources for shorebirds, supratidal habitats supplement energy in coastal estuaries worldwide. With expected decline of intertidal mudflats and restoration of salt production ponds to tidal marsh in south San Francisco Bay, management of supratidal ponds may help provide shorebird energy requirements. To evaluate changing conditions, we compared energy requirements and availability for eight shorebird species during the winters of 2007-2010 in 4 types of managed ponds - shallow seasonal and deeper circulation ponds each in two salinity classes. We applied a daily-ration model to evaluate carrying capacity as potential bird-days a site can support. We detected 64,253 shorebirds in average and 108,171 in peak years with >64% in seasonal ponds. Across the study area, ponds supplied 52% and 29% of energy required at average and peak abundances, respectively. Macrionivertebrate energy density was highest in mesohaline (5-30 ppt) circulation ponds and low in seasonal ponds. Available energy for shorebirds was substantially less than required in seasonal ponds but exceeded that required in mesohaline circulation ponds, which supported at least twice the bird-days per ha of available habitat compared with other pond types (>30 ppt). Our results suggest that salinity reduction to mesohaline levels and alteration of depth to increase accessibility could increase energy available for shorebirds to potentially offset loss of pond and mudflat areas.
KEYSTONE EFFECTS OF GIANT KANGAROO RATS IN CALIFORNIA GRASSLANDS

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Biology and Ecology of Small Mammals

Kangaroo rats have long been recognized as ecosystem engineers in arid and semi-arid grasslands. However, the pathways through which these species influence the diversity and dynamics of other species and ecological processes remain poorly understood. Here, we report results from a six year, large-scale exclosure study conducted in the Carrizo Plain National Monument, California. We present evidence showing powerful and cascading keystone effects of the giant kangaroo rat (Dipodomys ingens) through multiple pathways. Our findings have important implications for grassland restoration, rangeland management and, generally, biodiversity conservation.

AVIAN AND BAT FATALITY AT A REPOWERED WIND FARM IN THE ALTAMONT PASS WIND RESOURCE AREA

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Renewable Energy and Wildlife – Managing a Balance

Since wind turbines were first installed in the Altamont Pass Wind Resource Area (APWRA) in the early 1980s, researchers have documented numerous bird and bat fatalities. In an effort to reduce impacts to birds and bats in the APWRA, older wind turbines were replaced with more modern wind turbines, which are thought to be safer for birds and bats. We examined bird and bat collision mortality at one repowered wind farm in the APWRA from February 2008 to January 2011. During this study, we recorded 13 bat fatalities and 53 bird fatalities. Annual mortality rates adjusted for searcher detection and scavenger removal rates were 70.4 for birds and 26.7 for bats. The most common avian fatality observed was red-tailed hawk (Buteo jamaicensis) and the most common bat fatality was the hoary bat (Lasiurus cinereus). Avian and bat fatalities exhibited a seasonal pattern with few fatalities occurring in the winter. In addition, fatalities were not equally distributed among turbines suggesting elevation may be associated with greater fatalities. Additional research should be conducted to help determine the environmental causes of avian and bat fatality and to reduce wind farm fatalities.

DEPRESSED HATCHING AND EGGSHELL THINNING OF CALIFORNIA CONDORS REINTRODUCED TO CENTRAL CALIFORNIA

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Ecology and Management of Raptors

As part of the California condor recovery effort in central California, reintroductions of captive-reared condors were initiated in Big Sur in 1997 and in Pinnacles National Monument in 2003. From 2006-2010, we recorded 16 nestings by nine pairs and recovered eggs or shell fragments from 12 nests. Eggshell thinning averaged 34%, which we attributed to the DDT compound DDE. Hatching success in central California was 20-40%, significantly lower than 70-80% recorded in southern California. The outer crystalline layer was absent or greatly reduced, similar to the structural changes in thin-shelled condor eggs laid in southern California in the 1960s. Shell thickness was not related to egg size. Weight/water loss during incubation in the wild averaged three times
greater than the normal rate associated with successful hatching; the rate of loss increased significantly with decreasing shell thickness. Egg breakage accounted for only two of the 10 failures. Feeding on carcasses of California sea lions (*Zalophus californianus*), reintroduced condors now occupy a higher level of the food web. Like the other species previously affected, shell thickness is expected to recover as DDE contamination continues to decline.

**AVOIDANCE AND RELOCATION OF GIANT KANGAROO RATS AT THE CALIFORNIA VALLEY SOLAR RANCH**

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**Renewable Energy and Wildlife – Managing a Balance**

The California Valley Solar Ranch is a photovoltaic solar power production facility currently under development on approximately 1700 acres along the northern edge of the Carrizo Plain. The site supports a population of the endangered giant kangaroo rat (*Dipodomys ingens*), and the project has undergone extensive revision aimed at avoidance of this species and other sensitive resources. To date, over 200 giant kangaroo rats that could not be avoided have been relocated from impact areas to on-site conservation lands, and there is evidence of high post-release survival. Unique to this relocation program is the use of enclosures that impede giant kangaroo rat movement away from the release site. Over time, relocated giant kangaroo rats excavate new burrows that extend beyond the enclosure fence, yet they tend to remain at the release site, which has been confirmed through the deployment of a passive PIT-tag reader. Here we report preliminary findings of the giant kangaroo rat relocation program and describe new techniques that appear to have significantly enhanced the survival rate of giant kangaroo rats relocated at this site. These findings may benefit future relocation and reintroduction efforts for giant kangaroo rats and other endangered kangaroo rat species.

**DO HIGH ELEVATION MAMMALS MANAGE THEIR OWN HABITAT IN THE SIERRA NEVADA MOUNTAIN RANGE OF CALIFORNIA?**

**Jennifer Chase; U.S. Geological Survey; 568 Central Avenue, Bishop, CA, 93514; 760-873-5125; rcklinger@usgs.gov; and Rob Klinger**

**Climate Change and Wildlife: Managing Moving Targets**

There has been widespread concern that warming temperatures will facilitate transformation of herbaceous dominated alpine meadows communities to woody dominated communities, which would likely have serious impacts on many alpine mammal species. We used a combination of observational data and field experiments to quantify the extent and intensity of encroachment by conifers into alpine meadows in the Sierra Nevada range, and to evaluate the role herbivory and granivory play in conifer establishment in meadows. Conifer density in meadows, especially seedlings, was relatively low and had a strong negative correlation with distance from conifer stands. An exclosure experiment indicated that seed germination of lodgepole pine was 6x-8x greater and rates of whitebar pine seedling survival were an order of magnitude greater within than outside exclosures. Soil moisture influenced seed germination rates but was more important within than outside exclosures. Rates of seed germination were density-dependent, but the direction was negative outside of exclosures and positive within them. The results indicate that conifer encroachment into alpine meadows has been occurring primarily at the ecotone between meadows and conifer patches, and that plant-animal interactions can slow or even decouple what would be an otherwise climatic driven transition of meadows to woody dominated communities.
Abstracts for Oral Presentations Sorted Alphabetically by Author

**CANINE DISTEMPER OUTBREAK IN FREE-RANGING DESERT KIT FOXES INHABITING A SOLAR ENERGY DEVELOPMENT ZONE**

**Deana Clifford**: California Department of Fish and Game; 1701 Nimbus Rd, Rancho Cordova, CA, 95670; 916-358-2378; dclifford@dfg.ca.gov; Leslie Woods, Mourad W. Gabriel, Jaime Rudd, Edward J. Dubovi, Karen Terio, Francisco Uzal, Akinyi Nyaoke, Alfonso De La Mora, Santiago Diab, Mark T. Massar, Brian L. Cypher, Thomas B. Darden, Magdalena Rodriguez and Armand Gonzales

**Wildlife Diseases and Pathology**

In November 2011, a cluster of five desert kit fox (*Vulpes macrotis*) deaths were documented on and adjacent to a solar energy development in Riverside County, California. Necropsies and diagnostic tests were subsequently conducted on 13 carcasses. Canine distemper virus was the cause of death for 10/13 (77%) necropsied foxes based on histopathology, immunohistochemistry, virus isolation and sequencing. *Salmonella sp.* septicemia was documented in 7/10 (70%) distemper-infected foxes. In January 2012, 39 foxes from the outbreak site and three additional energy development sites at varying distances without documented mortalities were captured, examined, and tested. All captured foxes appeared healthy but catch per unit effort was low at the outbreak site, suggesting a localized reduction in the number of foxes. IgM antibodies were detected in 2/16 foxes (15%) from site 2, 19 km southeast of the outbreak. IgG antibodies were detected on 3/4 sites. Viral shedding was documented in 1/4 foxes at the outbreak site and 1/16 foxes at site 2, where CDV mortalities were subsequently documented. This is the first documentation of distemper mortalities in wild kit foxes. Continued monitoring is needed to understand the impact of disease in kit fox populations subject to disturbance from large-scale renewable energy development.

**EVALUATION OF THE GENETIC DISTINCTIVENESS OF GREATER SAGE-GROUSE WITHIN THE SOUTHWESTERN PORTION OF THEIR RANGE**

**Peter Coates**: U. S. Geological Survey, Western Ecological Research Center; 6924 Tremont Road, Dixon, CA, 95620; 530-669-5073; pcoates@usgs.gov; Michael L. Casazza and Sara J. Oyler-McCance

**Upland Habitats, Game Birds and Wildlife**

Greater sage-grouse (*Centrocercus urophasianus*) within the southwestern portion of their range (Bi-State Planning Area) are currently being evaluated for listing under the Endangered Species Act. This population segment was determined to be genetically distinct from other sage-grouse populations across the species range using a course sampling approach. We conducted a more in-depth genetic investigation by analyzing blood samples (n = 173), collected from eight locations within these populations and examined mitochondrial and microsatellite loci. We compared genetic data among subpopulations and also with two populations outside of the Bi-State Planning Area. Particular attention was paid to subpopulation boundaries and internal dynamics by drawing comparisons among particular regions within the Bi-State Planning Area and regions proximal to it. All newly sampled subpopulations contained mitochondrial haplotypes and allele frequencies that were consistent with the genetically unique sage-grouse described previously. We also found substantial variation in genetic diversity among subpopulations. We illustrate genetic divergence and diversity using spatially-explicit models developed in a geographical information system. This study further demonstrated that sage-grouse within the Bi-State are genetically unique and warrant special attention. Maintaining the genetic integrity of each population will help ensure the evolutionary potential for the sage-grouse within the Bi-State.
MODELING AND MAPPING HABITAT FOR GREATER SAGE-GROUSE WITHIN THE BI-STATE PLANNING AREA

Peter Coates; U. S. Geological Survey, Western Ecological Research Center; 6924 Tremont Road, Dixon, CA, 95620; 530-669-5073; pcoates@usgs.gov; Michael L. Casazza, Erik J. Blomberg, Ben Gustafson, Shawn Espinosa and Scott Gardner

Upland Habitats, Game Birds and Wildlife

Greater sage-grouse populations within the southwestern portion of their range (Bi-State Planning Area) are geographically isolated and genetically distinct from other populations. This population segment is of special concern and a candidate species under the Endangered Species Act. The purpose of this study was to develop a habitat map for sage-grouse within the Bi-State Planning Area bordering California and Nevada. We collected radio-telemetry locations (n > 13,000) across all major subpopulations and over a 7-year period (2003 - 2009). We used multiple environmental factors (e.g., land cover types, topographical, and anthropogenic) at different spatial scales as explanatory variables to model the probability of sage-grouse occurrence using generalized linear mixed models. We estimated resource selection functions and identified those factors that were most influential (selection or avoidance by sage-grouse). A predictive surface was developed using model averaged relative probabilities for the entire Bi-State Planning Area. Overall, the model accurately predicted sage-grouse locations from an additional independent data set (>97.1% within classified habitat). We further assessed model predictability using movement data from independent sage-grouse equipped with Global Positioning System transmitters. These results are intended to aid wildlife management actions and policies, as well as conservation planning, for this unique population of sage-grouse.

SURVIVAL OF MOUNTAIN QUAIL TRANSLOCATED FROM TWO DISTINCT SOURCE POPULATIONS

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Upland Habitats, Game Birds and Wildlife

Translocation of mountain quail (Oreortyx pictus) has become a common practice. A better understanding of the optimal proportion of individuals from different age and sex classes for translocation would benefit planning efforts. During 2006 and 2007, we captured 125 mountain quail from two ecologically distinct areas: 38 from southern California and 87 from southwestern Oregon. We radio-marked 58 of them and released all of them in south-central Idaho. We did not find evidence that source population influenced survival probabilities. Therefore, we pooled the data from each source and evaluated differences between sex and age classes in a post hoc model evaluation. Cumulative survival probability was $0.23 \pm 0.05$ at 150 d post-release. In the post hoc analysis, the most parsimonious model consisted of an interaction between sex and age. Adult male survival was substantially lower than other age and sex classes. Based on the results from this study managers appear to have flexibility in restoration alternatives when choosing between source populations. However, because adult males showed the greatest degree of mortality, managers should exercise caution in choosing the number of adult males to translocate during the spring months when males are more vulnerable to predators without adequate escape cover.
PEREGRINE FALCON (FALCO PEREGRINUS) PREY ITEMS IN THE ANZA-BORREGO DESERT

Marcus Collado; Wildlife Research Institute; 18030 Highland Valley Rd, Ramona, CA, 92065; 760-789-3992; mcollado@wildlife-research.org; Chris B. Meador, John D. Bittner and Renée Rivard

Ecology and Management of Raptors
It has long been assumed that peregrine falcons (Falco peregrinus) nest in and hunt shorebirds in areas associated with rivers, oceans or waterways. Further, the eradication of DDT has greatly increased their populations. Aerial surveys conducted by Wildlife Research Institute (WRI) have recorded since 2009 peregrine falcons in drier habitats, sometimes displacing and occupying territories historically established by prairie falcons. Due to the very large distance to any water bodies (approximately 42 km from the Salton Sea and 115 km from the Pacific Ocean) and the extremely barren nature of the badlands in which they lived, WRI has aimed to document the peregrine falcon’s prey base in these novel conditions to support themselves and three chicks. Motion-sensor cameras were installed in one remote nest cavity to record prey items delivered by adult peregrine falcons to their young in the Coyote Mountains of Anza-Borrego Desert. Data have indicated that the falcons mostly hunted small songbirds such as warblers and vireos as well as some lizards. This is the first year of WRI’s desert peregrine falcon study and we will present a preliminary description of our findings to date.

THE USE OF NEXT GENERATION SEQUENCING IN THE STUDY OF POPULATION GENETICS OF SMALL MAMMALS

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Biology and Ecology of Small Mammals
Next-generation sequencing has the potential to provide a more cost-effective and time-efficient way to generate genetic data. Several techniques show promise in the study of phylogenetic, phylogeographic, and population genetic relationships among non-model organisms, but sample preparation and bioinformatics remain problematic in the study of such organisms. We used a modified restriction digest method to reduce genomic complexity and massively multiplex barcoded samples collected from across a hybrid zone between Neotoma macrotis and N. fuscipes. Samples were sequenced on an Illumina GAIIx sequencer, and we analyzed using two pre-packaged programs and one program developed by a colleague.

We will discuss the pros and cons of the methods as applied to population genetics, as well as a comparison of analysis programs.

CONSERVATION SUCCESSES AND CHALLENGES IN THE U.S. FISH AND WILDLIFE SERVICE’S PACIFIC SOUTHWEST REGION (CALIFORNIA AND NEVADA) LISTING PROGRAM

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Endangered Species Act Implementation: Successes and Challenges
Implementation of section 4 of the Endangered Species Act has evolved over the past 40 years. Many listings of threatened and endangered species occurred initially and have continued over time. In many cases, development and implementation of recovery plans with many partners has helped conserve these species. Many species have received long-term protections through beneficial recovery-related actions, such as development of multi-species regional habitat conservation plans. In the early to mid 2000s, many critical habitat-related lawsuits resulted in increased effort by the U.S. Fish and Wildlife Service (Service) on designating critical habitat but took resources away from the Service’s listing program. A subsequent wave of listing deadline lawsuits further taxed limited
resources in the program. The Listing Program became reactive, and its ability to proactively address species conservation was diminished. Recent negotiations and a settlement with WildEarth Guardians and the Center for Biological Diversity resulted in a 5-year work plan that is allowing the Service to more efficiently carry out the Listing Program. Concurrent with this 5-year work plan, the Service is making changes both within the Pacific Southwest Region and nationally to develop and implement more efficient processes that will benefit implementation of both the Listing and Recovery Programs.

**THE BAKERSFIELD REGIONAL HABITAT CONSERVATION PLAN AND URBAN SAN JOAQUIN KIT FOXES: AN OPPORTUNITY FOR VALUE-ADDED CONSERVATION**

**Brian Cypher; CSU-Stanislaus, Endangered Species Recovery Program; P.O. Box 9622, Bakersfield, CA, 93389; 661-835-7810; bcypher@esrp.csustan.edu**

**Urban Wildlife, Management and Emerging Issues**

In 1994, the Metropolitan Bakersfield Habitat Conservation Plan (MBHCP) was adopted and implemented. Endangered San Joaquin kit foxes (*Vulpes macrotis mutica*) are among the species covered by this plan. Despite extensive development, kit foxes still occur within the city of Bakersfield, but the MBHCP provides minimal protections for urban foxes. Such protections consist primarily of attempting to avoid direct take by ensuring that known dens on project sites are vacant prior to den destruction. However, research over the past decade has revealed that this urban kit fox population is large, robust, and persistent, and therefore could contribute to range-wide conservation and recovery efforts for this species. The MBHCP expires in 2014 and work has begun on a new plan, the Bakersfield Regional Habitat Conservation Plan (BRHCP). This provides an opportunity to incorporate additional measures to conserve urban kit foxes. Such measures could include (1) expanded protections for dens, (2) expanding requirements to include currently exempted parties, (3) incorporating landscape design to provide refugia and corridors, (4) encouraging enhancements such as artificial dens, (5) funding an urban wildlife biologist position, and (6) increasing outreach and education efforts. Such measures would facilitate the continued persistence of a robust urban kit fox population.

**MITIGATING POTENTIAL IMPACTS TO WESTERN BURROWING OWL FROM WIND DEVELOPMENT IN PALM SPRINGS, CALIFORNIA: MITIGATION GUIDELINES IN THEORY AND IN PRACTICE.**

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**Renewable Energy and Wildlife – Managing a Balance**

The burrowing owl (*Athene cunicularia*) is a California Species of Special Concern that is declining throughout much of its California range. SWCA prepared and implemented a mitigation and monitoring program to address potential impacts to burrowing owls from the WPP-93 Wind Repower Project in Palm Springs, California. Mitigation measures were based on current CDFG Guidelines for Burrowing Owl Mitigation, which require that impacts to active burrowing owl burrows be mitigated through passive relocation of the owls and the permanent, off-site conservation of 6.5 acres of habitat. However, impacts from projects such as wind development may not result in permanent degradation of burrows or habitat, and permanent relocations may be counterproductive. We consulted with CDFG to identify a site-appropriate procedure for off-setting project impacts. We recorded a total of 43 active burrowing owl burrows within the project boundary, nineteen of which would be encroached by construction activity; constructed 33 artificial burrows; and conducted temporary passive relocations for the nineteen affected burrows. Eleven of the artificial burrows were occupied by passively-relocated burrowing owls.
within 48 hours of construction, and 75% of artificial burrows were occupied within 5 weeks of natural burrow closures. No owls were adversely impacted by project construction activity.

**TOXOPLASMOSIS DETECTION IN SOILS FROM O‘AHU, HAWAI‘I**

**Alisa Davis**; University of Hawaii at Manoa; 1910 East-West Rd., Sherman 101, Honolulu, HI, 96822; 808-343-3196; alisaad@hawaii.edu; Christopher A. Lepczyk, Clifford W. Morden and Susan E. Crow

**Island Ecosystems and Wildlife Management**

Feral cats have flourished in Hawai‘i due to the state’s favorable climate and people’s positive perception of cats. However, the presence of large numbers of feral cats has raised concern both in terms of predation of native species and as vectors of disease. One disease that has aroused a great deal of attention is toxoplasmosis, caused by the *Toxoplasma gondii* parasite. *T. gondii* oocyst presence in soil poses a potential health risk to people and is an environmental contaminant for the archipelago. Cats are the definitive host of *T. gondii* and concerns arise regarding transmission to humans due to the relationships people have with cats. Another important concern is that the parasite has infected endemic and endangered species found in the state. The goal of this project was to test soil from the University of Hawai‘i at Mānoa for *T. gondii* oocysts using molecular analysis methods. Soil was tested from cat colony sites at the university, as well as fecal samples from eight cats culled from the predator proof fencing project at Ka‘ena Point Natural Area Reserve. Methods included sample concentration using sucrose flotation methods, DNA extraction using QIAGEN QIAamp DNA Stool Mini Kit, and PCR analysis and electrophoresis.

**USE OF CAMERA TRAPS TO SURVEY FOR MOHAVE GROUND SQUIRRELS ON STATE AND FEDERAL LANDS: 2012 RESULTS**

**David Delaney**; U.S. Army CERL; 2902 Newmark Drive, Champaign, IL, 61822; 217-373-6744; David.Delaney@usace.army.mil; and Philip Leitner

**Biology and Ecology of Small Mammals**

Cost effective techniques are needed to locate the state-listed Mohave ground squirrel (MGS; *Xerospermophilus mohavensis*) throughout its range. Camera traps offer a new non-invasive way to survey MGS. Our objective was to improve our understanding of MGS distribution and demonstrate that camera trap technology is an effective method for surveying MGS across large geographic areas. Our study region ranged from Ridgecrest south and east to Hinkley within the western Mojave Desert in California. We surveyed 63 study sites across 6 different study areas (between 10-13 sites/study area) two times between February-June in 2012. Mohave ground squirrel detection rates varied from 30% at the Ridgecrest study area to 90% at multiple locations (Kramer/Harper Lake, Spangler, and Teagle study areas), with an average detection rate of 74.6% (47 of 63 sites with detections). Ten cameras were deployed at each site in a 2 x 5 pattern with 150 m spacing. Cameras were operated 24 hours/day on weekdays. Camera traps provided important information on species identification, animal visitation times, documented intra- and interspecific interactions, and recorded multiple examples of non-target species. We will also discuss the benefits of camera trap equipment and other possible future applications of this technology.
CONSERVATION BANKING: WHERE WE’VE BEEN AND WHERE WE ARE GOING

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The Endangered Species Act, Conservation Banking and Related Tools for Mitigating Impacts to Wildlife
Conservation banking for species mitigation had its roots in California during the mid-1990s. Since the issuing of the California Conservation Banking Policy in 1995, this program has evolved into a federal policy and program, with conservation banks found nationally and even internationally. The number of conservation banks has risen from a handful, primarily in California, to over one hundred in the United States. However, changes over time to the conservation banking policies and practices have resulted in a number of benefits and challenges to the program, with the law of “unintended consequences” being relevant to this program. Craig Denisoff, a former agency official involved in the development of the initial policy and private sector implementer of some of the initial conservation banks, will provide a prospective on the origins of the program and observations on where we are today, along with some projections of where conservation banking may be going in the future.

INSTALLATION OF GREAT GRAY OWL NEST STRUCTURES, OR IF WE BUILD IT, WILL THEY COME?

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Ecology and Management of Raptors
The great gray owl (Strix nebulosa), a State Endangered bird, is known as a boreal forest owl, although it is also known to occupy low elevation montane hardwood conifer habitats as well. Two birds were observed at an undisclosed location in the Central Sierra Nevada in the Spring of 2012. The land was planned for a timber harvest to reduce forest fuels. It is surrounded by USFS lands actively being managed for a number of purposes. Past research suggests that great gray owls will occupy constructed nest platforms in areas where such structures are in deficit or absent. This project partnered a conservation organization, the CA Dept. of Fish and Game and the Boy Scouts of America to build two types of nesting structures for the owl. Nest platforms were built by boy scouts for an Eagle Scout project. Three were placed in trees selected for their structure and proximity to a large meadow complex. One nest structure was constructed by topping a suitable tree and installing a depression at the top. Located in close proximity to the earlier owl observations, project staff are hopeful one or more of these structures will be utilized in the future. The forester in charge of the fuels treatment will establish a suitable retention area should the birds indeed nest. The area will be surveyed again to determine nest occupancy in spring 2013.

WILDLIFE, RECREATIONAL USAGE AND INFRASTRUCTURE DEVELOPMENT AT THE EAST BAY REGIONAL PARK DISTRICT

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Urban Wildlife, Management and Emerging Issues
The 78 year old East Bay Regional Park District, the nation’s largest local park district, continues to grow. It now manages over 111,000 acres of protected lands embedded in the metropolitan East San Francisco Bay Area, for public benefit and wildlife stewardship. Resource management conflicts within our park system include population growth, public infrastructure development, and impacts of climate change. Over ninety-five percent of our open space lands remain undeveloped and offer prime habitat for many species. However, humans can
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directly impact wildlife and habitat: from increasing trail use by mountain bikers and dog users, to internet-
popularized activities such as geocaching that encourage off-trail hiking and disturb sensitive species.
Human/wildlife conflicts along the urban/wildland interface are increasing due to perceived or actual 
overabundant populations of Canada goose, wild turkey, black-tailed deer, feral pig, coyote, bobcat, and mountain 
lion. For listed wildlife species, navigating the regulatory frame work associated with permitting to allow 
maintenance activities, minor infrastructure development and vegetation management to address increasing 
wildfire threats to the East Bay hills urban interface - is an expensive and complex challenge. Educating the 
public, especially youth, on how to protect and interact with wildlife is part of the District’s core mission.

HOME RANGE AND HABITAT ANALYSIS OF 
SANTA ROSA ISLAND FOXES (UROCYON LITTORALIS)
Elizabeth Drake; California Polytechnic State University; 935 Rio Verde Circle, Cottonwood, AZ, 86326; 406-
599-0346; lisadrake4444@gmail.com; John D. Perrine, Brian L. Cypher, Katherine Ralls, Tim J. Coonan and 
Russell White

Island foxes (Urocyon littoralis) are currently listed as federally endangered on the Channel Islands to which they 
are endemic. The Santa Rosa Island (SRI) population is recovering but still at low density. We examined space 
use patterns of foxes using GPS collars to assess home range overlap and habitat selection. The 95% minimum 
convex polygon home ranges averaged 3.39+/-.059km² with overlaps ranging from 0.1% to 28.3%. The 95% 
kernel density isopleth (KDI) home ranges averaged 3.82+/-.068km² with an overlap volume of 16%. These 
home range sizes are triple the size of other island fox studies, likely due to lower densities in the recovering SRI 
population. We used Euclidian distance analysis on the 95% KDI home ranges to determine selection for 
vegetation communities and topography at three scales: within the study area, home ranges and core areas. Within 
the study area, foxes selected for lupine, which no previous studies have documented. Within the home ranges 
and core areas, there was no significant selection for vegetation type. A more detailed analysis showed selection 
for bare and grassland habitats at night and valley bottom topography. This study provides baseline data for this 
recovering population and can guide habitat restoration efforts.

ESTIMATING NORTHERN SPOTTED OWL DETECTION PROBABILITIES USING TIMBER HARVEST SURVEY 
DATA ON A MANAGED LANDSCAPE IN NORTHERN CALIFORNIA
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dearly@greendiamond.com; Lowell V. Diller, Keith A. Hamm, David W. Lamphear, and Trent L. McDonald

Recent studies examining detection probabilities for northern spotted owls (NSO), including data used to develop 
the current USFWS NSO survey protocol, have primarily focused on known or historic spotted owl sites using a 
combination of nighttime and daytime calling. However, these studies lack timber harvest survey data where 
nighttime calling focusses on areas without known spotted owl sites. Therefore, we used spotted owl timber 
harvest survey data from 1994-2011 and site survey data from 2004-2011 to determine the appropriate number of 
complete surveys needed to achieve a 95% detection probability. We examined the variation in detection 
probabilities within a given year, between years, and for areas with and without barred owls (Strix varia). Results 
indicate a substantial variation in detection probabilities between years for both the timber harvest and site 
surveys, which is probably associated with weather and overall breeding success. The average number of surveys 
needed to reach the 95% detection probability for timber harvest surveys decreases throughout the breeding 
season, but detection probabilities were highest for site surveys during the middle of the breeding season. Similar

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to other studies, barred owl presence had a negative effect on spotted owl detection probabilities, requiring additional surveys to reach the 95% detection probability.

DYNAMICS OF THE PACIFIC COAST SNOWY PLOVER METAPOPULATION: THE ROLES OF CLIMATE AND MANAGEMENT

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Ecology and Management of Shorebirds
Spatial distributions of many endangered species are fragmented into distinct subpopulations due to human disturbance or natural geographic isolation. A valid assessment of metapopulation viability first requires a strong understanding of factors influencing subpopulation dynamics and the spatial extent at which these processes operate. Our study investigated two objectives pertaining to the federally threatened Pacific coast snowy plover metapopulation: 1) is subpopulation growth spatially autocorrelated, and 2) what factors contribute to spatial trends in metapopulation dynamics? We utilized 7-years of range wide census data collected between 2005 and 2011 to assess spatial autocorrelation in subpopulation growth rates and test hypothetical models predicting annual change in metapopulation dynamics based on site-specific climate and predator management. We found weak evidence supporting spatial autocorrelation in subpopulation growth rates using Moran’s I, however a linear mixed-effects model incorporating an interaction between local winter cold weather anomalies and spring precipitation predicted metapopulation dynamics with significant accuracy. Annual subpopulation growth was predicted to decrease after experiencing a winter with periods of extreme cold temperature, however when combined with a drier than average spring this trend reversed. Our findings suggest that there are stochastic environmental processes acting across this metapopulation that are beyond the control of management.

THE PITFALLS OF HERPETOFAUNAL SAMPLING IN DESERT TORTOISE COUNTRY

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Conservation and Biology of Amphibians and Reptiles
Strategies, solutions, and tradeoffs to ameliorate these difficulties.

CASE REPORT OF NATURAL EXPOSURE, AND ONE MORTALITY, OF NORTH AMERICAN RIVER OTTERS (LONTRA CANADENSIS) TO PARVOVIRUS IN A REHABILITATION CENTER

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Wildlife Diseases and Pathology
Two juvenile orphaned North American River Otters were presented to a northern California wildlife rehabilitation facility in June, 2012. Routine rehabilitation procedures were successful for the cohabitating otters for two months at which time one otter died. The only clinical signs prior to death were a mild decrease in activity and appetite. A full necropsy including ancillary diagnostics was performed and found to be most consistent with a parvovirus etiology. Specific findings included small intestinal lesions with epithelial crypts necrosis and blunting of villi on histopathology. The surviving otter exhibited initial three-day anorexia when moved to isolation, but has otherwise remained asymptomatic. Parvovirus PCR assays performed on the fecal samples of the surviving otter were positive on two instances approximately two weeks following the death of its cagemate. Although several studies have documented exposure to parvovirus, this is the first reported clinical case of
parvovirus in North American River Otters. The source of exposure is unknown, though contributing factors may be fecal contamination from previous captive wildlife or from infected free-ranging wildlife. These findings illustrate the susceptibility of mustelids to parvoviruses and the need to reduce risks from fecal contamination within and adjacent to wildlife facilities from environmentally resistant pathogens.

**IMPLEMENTING SECTION 7: CASE STUDY OF A SOLAR ENERGY PROJECT**

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**Endangered Species Act Implementation: Successes and Challenges**

Section 7 is the process by which the Fish and Wildlife Service ensures: 1) Federal Action agencies have minimized likely effects of a project on potentially affected listed species, 2) the project does not jeopardize listed species, and 3) the remaining take is exempted from the prohibitions of take in Section 9 of the Act, provided that the project is implemented as described and the Terms and Conditions of the Biological Opinion (BO) are met. While all of this sounds complicated on paper, it is even more so in the real world application. Using the Ivanpah Solar Electric Generating System (ISEGS) Project, we will discuss the implementation of conservation measures and adaptive management of these measures. ISEGS is a ~4000 acre solar project that began construction in October 2010 adjacent to Interstate 15 in California, near the Nevada State Line. The listed species affected by the project is the desert tortoise. Topics to be covered include: clearance surveys, translocation protocols, control vs. treatment groups, fencing management, and head starting. This case study will demonstrate agencies and project managers need to keep focused on the overall goal - minimizing impacts - as the project proceeds and conservation measures of the BO are implemented.

**BLM’S RECOVERY FUND: AN EXAMPLE OF SECTION 7(a)(1)**

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**Endangered Species Act Implementation: Successes and Challenges**

Prior to 2010, the Bureau of Land Management state offices would annually compete for special funds devoted to short-term projects for listed species. Because of how the selection process worked, it was highly unlikely for similar projects to get funding for several years. This resulted in a shotgun approach to funding projects for listed species management, with little to demonstrate any change in the trends of listed species. In 2010, the BLM made a bold move to change how it distributed its base funds for threatened and endangered species. Partnering with the US Fish and Wildlife Service, the two agencies selected species each felt that, with a concerted effort, BLM had the ability to actually change the listing status of the species, either a down-listing or a de-listing. The program allows for a state office to request several years of funding, instead of an annual request, so larger, longer term projects could be implemented. Through this program, BLM California has been able to assist FWS in its mission, as directed under Section 7(a)(1). The results of the last 3 years will be shared; with case studies on Inyo towhee, giant kangaroo rat, San Benito primrose, and beach layia.
STATUS AND TRENDS OF NESTING OSPREY AT
MONO LAKE TUFA STATE NATURAL RESERVE, 2004 - 2012

Lisa Fields; California State Parks; Southern Service Center, NTC at Liberty Station, 2797 Truxto, San Diego, CA, 92106; 619-221-7044; lfields@parks.ca.gov; Peter H. Bloom and Scott Thomas

Ecology and Management of Raptors
The osprey (Pandion haliaetus) is a fish-eating bird known for nesting within 1 mile (1.6 km) of fishable waters. Osprey have been expanding their range in California since the 1970s and in 1985 were first observed at Mono Lake, a fishless hyper-saline lake located on the east side of the Sierra Nevada in Mono County, California. Located at an elevation of approximately 6384 feet, Mono Lake is surrounded by Great Basin Desert vegetation, and has minimal development along the shoreline. It also has minimal fishable waters within proximity of the osprey nest locations. The primary nesting area is a minimum of 1.5 miles (2.4 km) from fishable waters with a range of 0.5 mile (0.8 km) to over 3 miles (4.8 km) to the nearest fishable waters. Annual monitoring of nesting success was initiated in 2004; banding of nestlings in 2009. The population grew to 5 pairs prior to monitoring and since has continued to increase with 8 pairs observed since 2010. The total number of distinct nesting sites has also increased during this time. Despite the atypical conditions, this population has averaged a relatively high annual fledging rate of 1.47 young per active nest (SD +/- 0.44).

PRBO'S RANGELAND WATERSHED INITIATIVE: MEASURING THE SOIL, VEGETATION, AND WILDLIFE BENEFITS OF PRESCRIBED GRAZING

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Grazing, Agriculture and Wildlife Conservation
PRBO Conservation Science (PRBO) is collaborating with the USDA-Natural Resources Conservation Service (NRCS), cooperating ranchers, and several partners to improve foothill rangeland watersheds in the Sacramento Valley after decades of heavy use. By applying prescribed rangeland grazing and management practices, ranchers with support from NRCS Farm Bill programs, PRBO and partners will increase soil water retention in foothill watersheds, improve water supply reliability downstream, enhance ranching productivity, and expand riparian and wetland habitat for migratory birds and other wildlife. In addition, we will partner with and mentor ranchers as Leopoldian land stewards to ensure long-term ecological and production benefits on their land. PRBO is collaborating with the California Rangeland Watershed Laboratory at the University of California, Davis to document and evaluate hydrological and soil carbon sequestration, and wildlife habitat benefits of the prescriptive grazing and associated rangeland management practices. The three-year study will provide empirical evidence on the effectiveness of prescribed grazing and rangeland management practices in providing reliable water supplies, improving soil quality, sequestering soil carbon and improving wetland, riparian and upland fish and wildlife habitats.

THE TREE IS DEAD. LONG LIVE THE TREE. DO MONARCH BUTTERFLIES PREFER OR SIMPLY USE EUCALYPTUS FOR OVERWINTERING ROOSTS?

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Urban Wildlife, Management and Emerging Issues
Western monarch butterflies (Danaus plexippus) overwinter along the California coast in wooded groves, where they typically aggregate into clusters on a subset of available trees. Blue gum eucalyptus (Eucalyptus globulus) is
often a numerical dominant at overwintering sites. We tested whether monarchs actually prefer this species or appear to prefer it because of its prevalence. We find that though monarchs frequently use eucalyptus, this is generally not the only species used (unless it is the only species present). Further, sometimes the use of alternate tree species (when available) is disproportionately high. We conclude that eucalyptus trees are likely utilized because they are present, but not preferentially.

RECOVERY OF THE ALEUTIAN CACKLING GOOSE: AN ESA SUCCESS STORY

Kenneth Griggs; USFWS, Humboldt Bay National Wildlife Refuge Complex; P.O. Box 576, Loleta, CA, 95551; 707-733-5406; kenneth_griggs@fws.gov; and Eric T. Nelson

*Endangered Species Act Implementation: Successes and Challenges*

Aleutian cackling geese (*Branta hutchinsii leucopareia*) serve as a true success story of the Endangered Species Act, illustrating the positive impact of regional, jurisdictional, and cross-programmatic cooperation. This species was pushed to the brink of extinction due to introduction of arctic foxes on breeding islands, leading to their listing under the ESA. Fox removal, translocation of birds, captive breeding programs, establishment of National Wildlife Refuges and conservation easement areas, and targeted habitat management contributed to the remarkable recovery of this species. The population was < 1,000 individuals in 1967, increased to >30,000 in 2001 when it was de-listed, and now exceeds 135,000. With exponential population growth occurring from the mid-90s through recent years, complex management challenges have risen. Many of these stem from conflicts with private agricultural landowners whose short grass pastures are being fed on by Aleutians. This presentation details the efforts that lead to this bird’s recovery, describes management actions taken on the breeding, wintering and spring staging grounds on behalf of this species, explains the current conflicts facing state and federal land managers, and steps being taken to find solutions to these issues.

SB 1148 - A NEW PROCESS FOR CONSERVATION BANKING IN CALIFORNIA

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*The Endangered Species Act, Conservation Banking and Related Tools for Mitigating Impacts to Wildlife*

Dr. Ben Guillon will describe how the recent Senate Bill 1148 changes the conservation banking program in California and why it could be used at a model in other states. Due to budget restrictions, the California Department of Fish and Game had to put a moratorium on its conservation banking program in March 2012. Subsequently, Department’s staff worked closely with a coalition of mitigation bankers, landowners and consultants to pass a comprehensive bill that ensure a sustainable source of funding as well as clear performance targets for the program. Applicants to a Banking Enabling Instrument will now be assessed a fee to cover the review costs by the Department and, in return, the Department has agreed to clear process for the review as well as timelines for comment periods. One limitation of the new bill is that it does not address the issue of ecological effectiveness of mitigation measures and specifically does not address the need for higher standards and monitoring for all types of mitigation.
WHY THE DENOMINATOR IN AVIAN AND BAT FATALITY ESTIMATES MATTERS; EXAMPLES FROM Tehachapi AND OTHER WIND RESOURCE AREAS
Dave Hacker; CDFG; 3196 S. Higuera St., Ste. A, San Luis Obispo, CA, 93401; (805) 594-6152; dhacker@dfg.ca.gov

Renewable Energy and Wildlife – Managing a Balance
Wind farm avian and bat fatality estimates are typically presented as fatalities/megawatt (MW)/year or fatalities/turbine/year, and then compared to other wind farms’ fatality estimates to assess the relative impacts. Mitigation requirements are often based on the results of these comparisons. However, the per-MW or per-turbine estimates obscure the whole wind project’s direct biological impacts, and the comparisons among wind projects are often misleading because the total number of MW or turbines on each project is rarely a common denominator. I used fatality estimates from projects in different wind resource areas, including California’s Tehachapi region, to demonstrate that wind farms with low fatality/MW/year estimates can have relatively high fatality/project/year and fatality/turbine/year estimates compared to projects across North America. I found that a wind farm’s relative biological impacts can be portrayed in vastly different lights, depending on which denominator (MW, project, or turbine) is used. Projects with relatively moderate fatality rates per MW may have the highest total-project fatality rates. I conclude that, to better inform land-use decision makers and the public, we should use the simplest common denominator of 1 project to more transparently disclose the direct impacts and make more valid comparisons of projects’ avian and bat fatality rates.

THE PHYSIOLOGICAL EFFECTS OF LONG-DISTANCE TRANSLOCATION ON SOUTHERN PACIFIC RATTLESNAKES (CROTALUS OREGANUS HELLERI)
Kory Heiken; California Polytechnic State University; 1 Grand Avenue, San Luis Obispo, CA, 93407; (949) 412-1771; kheiken@calpoly.edu; Sarah Gartland, Timothy Sorrells, George A. Brusch IV, Ignacio T. Moore and Emily N. Taylor

Conservation and Biology of Amphibians and Reptiles
Long-distance translocation (LDT), the relocation of animals to an area outside of their home range, is a popular strategy for mitigating conflict between humans and venomous snakes. While LDT prevents a snake’s return to the capture location, it can result in increased mortality, magnitude and frequency of movements, and activity range sizes. Such outcomes suggest that LDT may result in chronic stress and the disruption of other key aspects of a snake’s physiology, such as thermoregulation. However, the physiological effects of LDT on snakes have gone unstudied. To elucidate effects of LDT on stress physiology and thermoregulation, we conducted an experimental LDT on Southern Pacific Rattlesnakes (Crotalus oreganus helleri), on Vandenberg Air Force Base in central California. Fifteen rattlesnakes were monitored beginning in mid July 2012. In late August, seven snakes were translocated approximately 30 kilometers and subsequently monitored for 8-12 days. Body temperatures and indices of thermoregulation effectiveness will be compared between translocated and control snakes, as well as within the translocated group, before and after translocation. Baseline blood concentrations of corticosterone, the primary stress hormone in reptiles, and the corticosterone response to an acute stressor, will be compared in the same manner.
Abstracts for Oral Presentations Sorted Alphabetically by Author

**DESER T TORTOISE AND THE IVANPAH SOLAR ELECTRIC GENERATING SYSTEM (ISEGS): AN UPDATE ON TRANSLOCATION AND THE IMPLEMENTATION OF A LONG-TERM MONITORING PROGRAM**

Kelly Herbison; ISEGS Designated Biologist; 51187 Gamma Gulch Rd, Pioneertown, CA, 92268; (714) 394-1563; kellyherbinson@gmail.com

*Renewable Energy and Wildlife – Managing a Balance*

Despite preliminary surveys that underestimated desert tortoise abundance at ISEGS, regulatory agencies, consultants and the client worked together to adaptively manage the 170 tortoises that were located on site and the 53 tortoises that hatched in captivity. All tortoises found on site over 120 mm were translocated in the spring and fall of 2012. A Headstart facility was built to house the 53 tortoises that hatched on site and the additional 69 juvenile tortoises that were found on site for five years until they will be released back into the wild. Consultants designed and began implementation of the “Effectiveness Monitoring Plan” a 10-year study assessing survivability of translocated versus non-translocated tortoises. Data is currently being collected on desert tortoise habitat characteristics, movement, health, environmental toxicants, thermoregulation and road noise and vibration for translocated, resident and control tortoise populations. Over the next several years, the data will be put into a model designed to assess how these factors influence survival of translocated tortoises.

**CUMULATIVE REPRODUCTIVE SUCCESS OF SNOWY PLOVERS IN COASTAL NORTHERN CALIFORNIA**

Dana Herman; Department of Wildlife, Humboldt State University; 1 Harpst Street, Arcata, CA, 95521; 707-953-2825; danaherman3@gmail.com; and Mark A. Colwell

*Student Paper*  

*Ecology and Management of Shorebirds*

Conserving imperiled species requires knowledge of species’ breeding productivity and the factors that cause variation in reproductive success; such information is crucial for evaluating management practices and monitoring recovery objectives. We analyzed cumulative reproductive success of 251 individually marked Snowy Plovers (*Charadrius nivosus*) monitored over 12 years in coastal northern California. Reproductive success was highly skewed toward a few individuals in the population, with 13% of males and 14% of females producing 50% of fledglings; 39% of adults fledged no young, while 72% fledged 2 or fewer. This pattern of unequal progeny production is a consequence of differences in breeding habitat quality, as mediated by corvid predation, human disturbance and differences in substrate type. Such high variance in reproductive success has strong implications for effective population size (Ne); populations with low Ne values are more susceptible to extinction due to decreased fitness and high inbreeding potential.

**SHY VERSUS BOLD: CAN DESERT TORTOISE PERSONALITIES PREDICT MOVEMENT PATTERNS DURING TRANSLOCATION EVENTS?**

Danna Hinderle; Senna Biological; 4738 Atlanta Drive, San Diego, CA, 92115; 303-884-4664; dhinderle@hotmail.com; Jennifer Germano and Doug Deutschman

*Conservation and Biology of Amphibians and Reptiles*

Behavioral syndromes, or animal personalities, are an emergent area of study in behavioral ecology. Such syndromes aim to identify suites of correlated behaviors across time and within different contexts. These syndromes act to constrain an individual’s behavioral response in varied environments, and because the animal may not be able to respond in an optimal manner, theory suggests there are fitness trade-offs. For example, a bold
CHALLENGES OF MANAGING THE BALANCE

**Bronwyn Hogan;** U.S. Fish and Wildlife Service; 916-978-4353; bronwyn_hogan@fws.gov; and Ashleigh Blackford

**Renewable Energy and Wildlife – Managing a Balance**
Balancing renewable energy development with conservation of wildlife is full of challenges. We provide an overview of some of those challenges from the U.S. Fish and Wildlife Service perspective with regard to project specific and landscape level planning. Early coordination and appropriate siting are invaluable tools when considering how to avoid and minimize impacts on listed species and other trust resources. We will consider opportunities to engage effectively in these efforts for project and landscape level planning. We will also discuss the challenges in identifying appropriate compensation for impacts to species. We will look at some examples of landscape level planning efforts and discuss lessons learned and opportunities for continued refinement and public involvement.

ROAD IMPACTS ON MOUNTAIN LIONS: USING ROAD KILL, GPS COLLAR DATA, AND CONNECTIVITY MODELING TO PRIORITIZE MANAGEMENT ACTIONS

**Patrick Huber;** Information Center for the Environment, UC Davis; One Shields Ave., Davis, CA, 95616; 530-754-6621; prhuber@ucdavis.edu; T. Winston Vickers and Walter M. Boyce

**Ecology and Management of Large Mammals and Carnivores**
Road impacts are a threat to many species due primarily to habitat fragmentation and direct mortality from vehicle collisions. We studied the effects of a relatively new highway on mountain lions and several other species in Orange County, California. We used three different types of data: road kill records, GPS collar data, and least cost connectivity models. Road kill records indicated that 11 mountain lions had been killed by cars in the study area since highway construction. Mountain lion GPS collar data was collected at varying intervals from every five minutes to every six hours. GPS points taken at five minute intervals were used to identify 20 crossing locations, and least cost connectivity models using longer interval data were utilized to estimate the locations of 55 additional crossing events. Because impacts were being assessed for multiple species, deer survey and road kill data were used to identify areas of high risk for other species. The highway section being studied was then split into 500-meter segments. The various data were combined into a final impact score and values were assigned to each 500-meter segment. Results will be used to prioritize future management actions by the highway management agency.

SHOREBIRD USE AND NESTING SUCCESS IN RICE FIELDS AND WETLANDS OF THE SACRAMENTO VALLEY

**Monica Iglecia;** Audubon California; 765 University Drive, Sacramento, CA, 95825; 916-649-7600; miglecia@audubon.org; Jennifer A. Dhundale, Michael A. Hardy, Dan A. Skalos, Karen L. Velas and T. Rodd Kelsey

**Ecology and Management of Wetlands and Waterbirds**
With the loss of 90% of natural wetlands in California’s Central Valley, the 200,000 ha of rice fields may provide critical nesting habitat for wetland-dependent birds. 37%, 74%, and 47% of California’s breeding populations of American Avocet, Black-necked Stilt, and Black Tern occur in the Sacramento Valley; 90% are observed within...
rice fields. In collaboration with the California rice industry, the Natural Resources Conservation Service, and the U.S. Fish and Wildlife Service, we monitored four shorebird species in managed wetlands and rice fields and assessed the value of alternative rice field management to enhance breeding habitat. Rice field modifications included widening and flattening internal field levees and installing islands. In 2012, we worked with 12 rice farms and two National Wildlife Refuges to quantify the abundance and nest success of breeding shorebirds on modified and unmodified rice fields, and wetlands in the Sacramento Valley. Overall, we found 142 nests. Mayfield estimates of nest success (0.03, 0.55, 0.37, and 0.85 for avocet, stilt, killdeer, and tern, respectively) suggest that breeding birds could benefit from habitat enhancement on rice fields and wetlands, and that timing of flooding could have a large influence on habitat value.

EMERGING BIG GAME MANAGEMENT IN HAWAI’I: CURRENT CASES AND FUTURE PROSPECTS

Ed Johnson; HI Div. of Land & Nat. Res./Wildlife; 1151 Punchbowl #325, Honolulu, HI, 96813; 808-347-7255; edjohnson908@gmail.com

Island Ecosystems and Wildlife Management

Big game management is a strange creature in Hawai’i; not quite there but definitely not absent. For nearly 50 years under the Territory of Hawai’i, the Boards of Agriculture and Forestry respectively managed what finally became the big game animals of the state, namely the feral pig, feral goat, axis deer, black-tailed deer, and wild sheep, which include feral sheep, mouflon sheep, and feral-mouflon hybrids.

EFFECTS OF URBANIZATION ON BATS IN CALIFORNIA: WINNERS AND LOSERS

Dave Johnston; H. T. Harvey & Associates; 983 University Ave., Bldg D, Los Gatos, CA, 95032; 408-458-3226; djohnston@harveyecology.com

Urban Wildlife, Management and Emerging Issues

Urbanization causes habitat degradation, land use conversion, habitat fragmentation, and possible population sinks that ultimately lead to local extirpation of bats. Although there is a general paucity of empirical evidence for the loss of bat populations as a result of urbanization in California, early studies have provided invaluable records for areas that were later developed. Recent 2008 bat surveys were compared with bat surveys from 1948 suggest that urbanization reduced the numbers of roosts and population size for pallid bats in Santa Clara and San Diego counties. An acoustic study of bat activity in agriculture, rural, and urban habitats in Monterey County suggest that species richness is lowest in urban habitats (M = 3.44; SE = 0.47) when compared to agriculture (M = 4.28; SE = 0.63) or rural (M=7.11;SE=0.59), yet urban habitats had the greatest mean overall activity (M = 127.81; SE = 76.48) when compared to agriculture (M = 32.67 SE=10.03) or rural (M=73.42; SE=26.47). The highest activity levels associated with urban areas are a result of population increases in the Brazilian free-tailed bat (Tadarida brasiliensis) and the Yuma myotis (Myotis yumanensis). Both species have greatly benefited from adapting to roost in anthropogenic structures associated with urban areas.
MONITORING POTENTIAL IMPACTS TO BIRDS AND BATS AT A MAJOR PHOTOVOLTAIC POWER PLANT IN CENTRAL CALIFORNIA - IMPLEMENTING AN AVIAN AND BAT PROTECTION PLAN

Dave Johnston; H. T. Harvey & Associates; 983 University Ave., Bldg D, Los Gatos, CA, 95032; 4084583226; djohnston@harveyecology.com; Jeffrey P. Smith, Kim Briones, Gabriel Reyes, Meredith Jantzen, Jeff Seay, Sara Snyder and Michelle Graeser

Renewable Energy and Wildlife – Managing a Balance

The California Valley Solar Ranch (CVSR) project is a 250 MW solar photovoltaic power plant located in the NE Carrizo Plain, San Luis Obispo County, California. We developed and implemented an Avian and Bat Protection Plan (ABPP) as a voluntary document to help avoid and minimize regulated impacts. The plan comprises 3 plus years of avian monitoring, bat monitoring, golden eagle monitoring, burrowing owl monitoring, and fatality monitoring. For avian monitoring, we conduct monthly point counts at 14 locations. For bat monitoring, we installed pairs of zero-crossing and full-spectrum bat detectors at each solar array and in nearby conservation lands and we are monitoring the populations of two nearby pallid bat maternity colonies. For burrowing owls we are monitoring breeding pairs on conservation lands adjacent to the arrays and for golden eagles we are monitoring nests within 10 miles of the project site. The fatality searches make up the greatest effort and include specific protocols for carcass searches under the connecting high tension power lines, each array and corresponding control plots, the fences, the medium voltage power lines, and after they are built, the detention basins. We will present a summary of our 2012 data comprising mostly baseline data.

ADAPTIVE MANAGEMENT AND THE RECOVERY OF THE RIPARIAN BRUSH RABBIT

Patrick Kelly; California State University, Stanislaus; One University Circle, Turlock, CA, 95382; 209-667-3446; pkelly@csustan.edu; Matthew Lloyd, Kim Forrest, Jeff Holt, Tristan Edgarian and Julie Rentner

Biology and Ecology of Small Mammals

The riparian brush rabbit occupies riparian communities in the northern San Joaquin Valley. Due to threats from fire and flood to the two known populations, a captive breeding program was initiated. Between 2002 and 2005, 404 captive-bred rabbits were released on the San Joaquin River National Wildlife Refuge. Monitoring indicated that captive-bred rabbits were reproducing and offspring were dispersing throughout the refuge. In spring 2006, severe flooding resulted in the mortality of 91% of radio-collared rabbits. The only rabbits known to survive were in small areas of vegetated levee that remained dry during the peak flood stages. Starting in 2007, 8 large mounds of compacted dirt were constructed in naturally elevated areas, and 25 mounds were constructed using spoil gathered from the excavation of wetlands. Each was vegetated with dense brush, as was 5 mi. of retired flood control levees. Between 2006 and 2010, 397 more captive-bred rabbits were released on the refuge. Monitoring showed that the population had rebounded from the 2006 flood. The refuge again experienced severe flooding in spring 2011, but unlike the situation in 2006, many rabbits survived on the vegetated mounds and levees. Lessons learned are now being applied in other brush rabbit conservation areas.
**SMALL MAMMALS EXHIBIT LIMITED SPATIO-TEMPORAL STRUCTURE IN SIERRA NEVADA FORESTS**

**Douglas Kelt**, University of California; One Shields Avenue, Davis, CA, 95616; 530-754-9481; dakelt@ucdavis.edu; Dirk H. VanVuren, Michael L. Johnson, James A. Wilson, Robin J. Innes, Brett R. Jesmer, Ryan D. Burnett, Katherine P. Ingram, Jaya R. Smith, Seth W. Bigelow and Peter A. Stine

**Biology and Ecology of Small Mammals**

Forests in the Sierra Nevada have been substantially altered over the past century and a half by fire suppression, logging, and other human activities. Current forest management endeavors to maintain/restore resiliency in the face of contemporary disturbance factors which include wildfire, climate change, continued urbanization, and invasive species. To determine responses of small mammals to forest management we monitored a series of replicate trapping grids in compositionally homogeneous forest over 8 years, and implemented 2 levels of canopy thinning in 9 experimental plots. Live-trapping efforts (119,712 trap-nights) yielded 15,613 captures of 4,994 individuals of 14 species, and while forest structure was significantly influenced by canopy treatments, small mammal numbers and assemblage composition were not. To better understand this we assessed habitat associations of small mammals at 599 points on 75 sampling transects established in a stratified random manner throughout the Forest. We analyzed these data with two forms of constrained ordination (canonical correspondence and canonical correlation) considered to be complementary and effective methods for extracting major gradients in one data set (e.g., distribution of small mammal captures) and explaining these in terms of measured variables from a second data set (e.g., habitat and environmental measurements). Over 3 years we tallied 57,504 trap-nights of effort and captured 1,367 individuals of 11 species. Both forms of ordination exposed significant associations between small mammals and underlying habitat metrics, but they explained remarkably little variation in these data, suggesting that small mammals are responding only modestly to habitat variation as expressed by the available environmental variables measured at each plot. We followed this with stepwise multiple regression in an attempt to build models to explain habitat associations of these species. We applied model-averaging and employed Akaike’s Information Criterion (AIC) to evaluate candidate models. Reflecting ordination results, “competitive models” (e.g., those with AIC < 2.0) cumulatively explained little variation (12-36%) and regression coefficients were very low. Hence, both ordination and multiple regression suggest that the limited response by small mammals to canopy thinning reflects the generalist habits of the common species in this forest. We propose that anthropogenic influences have led to structural homogenization of these forests, even across >800 m of elevation, such that habitat specialists (e.g. old-forest-dependent species; e.g., *Myodes californicus*) are unable to find productive habitat. Further efforts should target non-forested habitats (meadows, riparian corridors), but results presented here suggest that managers should strive to increase heterogeneity at large spatial scales and especially to promote the development of mature forest structure.

**CALIFORNIA BATS AVOID ROADS**

**Justin Kitzes**, Department of ESPM, University of California, Berkeley; 130 Mulford Hall #3114, Berkeley, CA, 94720; 650-804-0984; jkitzes@berkeley.edu; and Adina M. Merenlender

**Urban Wildlife, Management and Emerging Issues**

Although the negative impacts of roads on terrestrial vertebrate and bird populations are well documented, there have been few studies of the road ecology of bats. To investigate the effects of roads on bat activity, we conducted acoustic surveys of bat calls along ten 300 m transects bordering three large highways near San Francisco Bay. Nightly counts of bat passes were analyzed with generalized linear mixed models to determine the relationship between bat activity and distance from a road. Total bat activity recorded at points adjacent to roads is found to be approximately one-half of the level observed at 300 m. Statistically significant decreases in activity near roads are also found for the Brazilian free-tailed bat (*Tadarida brasiliensis*), big brown bat (*Eptesicus fuscus*), hoary bat
(Lasiurus cinereus), and silver-haired bat (Lasionycteris noctivagans). This road effect is temperature dependent, with hot days both increasing total foraging activity at night and reducing the difference between activity levels near and far from roads. Decreases in bat activity in the vicinity of roads may have implications for both bat conservation and the provision of insect control services.

**HABITAT SELECTION AND ENVIRONMENTAL CORRELATES WITH LOCAL SCALE OCCUPANCY PATTERNS OF AMERICAN PIKA IN THE SIERRA NEVADA RANGE**

Robert Klinger; U.S. Geological Survey; 568 Central Avenue, Bishop, CA, 93514; 760-873-5125; rcklinger@usgs.gov; Cody Massing and Sarah Stock (presenting)

**Climate Change and Wildlife: Managing Moving Targets**

We used a combination of line transect and point count surveys to collect data on habitat selection and occupancy patterns of American pika from 2008 through 2012 in the Sierra Nevada range. Though they were most strongly associated with open talus at both regional and local scales, pika also occupied talus patches embedded in conifer, shrub and meadow vegetation types, and the strength of their habitat selection patterns varied both interannually and spatially. We compared relative support for models of local occupancy with land cover variables only, climate variables only, and topographic variables, as well as models with a combination of the best supported variables from each of the individual climate, topographic, and land cover sets. The probability of local site occupancy by pika had a negative relationship with the proportions of woody and meadow vegetation type and mean maximum July temperature, and positive relationships with the number of different vegetation types and slope. Land cover variables were stronger predictors of occupancy than temperature and slope. The results suggest that pika in the Sierra Nevada can adjust their habitat selection, and that factors other than just those that are climate-related have a strong influence on local persistence patterns.

**DISTRIBUTION AND ABUNDANCE OF AMERICAN PIKA IN THE SIERRA NEVADA AND WHITE MOUNTAIN RANGES OF CALIFORNIA**

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**Climate Change and Wildlife: Managing Moving Targets**

We used a combination of line transect and point count surveys to collect data on distribution, abundance and habitat use of American pika in the Sierra Nevada and White Mountain ranges of California between 2008 and 2012. Pika occurred widely throughout the alpine and subalpine zones in both ranges, but their distribution was very patchy and occupancy and abundance highly variable. Approximately 37% of the study area was occupied by pika, but variability in occurrence within a given geographic region was as high as variability between regions. Occupancy expanded between 2008 - 2009 and 2011 - 2012, but contracted between 2010 - 2011. Density was highly variable at patch, local, and regional scales; areas in both mountain ranges that had high abundance in one year could have much lower abundance the next year and vice versa. Rangewide density in the White Mountain was generally 3-4 times greater than that in the Sierra Nevada (12.2 km² ± 1.4 SE vs. 3.5 km² ± 0.4, respectively), but density decreased by about 50% in both ranges following the winter of 2010/2011. Though very dynamic, even in years when populations are low tens of thousands of individuals occur in the two mountain ranges.
HABITAT ASSOCIATIONS OF FOUR ALPINE MAMMAL SPECIES IN THE SIERRA NEVADA RANGE OF CALIFORNIA

Robert Klinger; U.S. Geological Survey; 568 Central Avenue, Bishop, CA, 93514; 760-873-5125; rcklinger@usgs.gov; Cody Massing and Sarah Stock

Climate Change and Wildlife: Managing Moving Targets
We used data from line transect and point count surveys conducted between 2008 and 2012 in the Sierra Nevada mountain range to analyze the degree of overlap in macro and microhabitat use and selection by American pika, yellow-bellied marmot, Belding’s ground squirrel, and golden-mantled ground squirrel. Our goals were to: (1) evaluate the likelihood of consistent responses among the four species to changes in their habitat; and, (2) evaluate the validity of applying the indicator species concept to the assemblage. All four species used each of five major land cover classes, but each had different patterns of selection among the classes, and the magnitude of selection could change depending on the availability of the classes within a given geographic region. Redundancy Analysis indicated that the species were separated in environmental space, with each being associated with different topographic, land cover, climatic, vegetation and productivity gradients. The results indicate that while the four species are sympatric throughout the Sierra Nevada they differ in habitat use and selection and are associated with different habitat gradients. This suggests that they are unlikely to respond similarly to changes in their habitat, hence applying the indicator species concept to the assemblage is inappropriate.

CONSERVATION BANKING AND LAND TRUSTS

Rebecca Kramer; Director, Center for Natural Lands Management; 27258 Via Industria, Suite B, Temecula, CA, 92590; 510-725-4691; rkramer@cnlm.org;

The Endangered Species Act, Conservation Banking and Related Tools for Mitigating Impacts to Wildlife
Mitigation and Conservation Banking have a defined collaborative structure - the regulatory/permitting agencies, the banker, and the not-for profit partner, such as a land trust. The partner land trust generally provides the third party monitor role as holder of the Conservation Easement (CE); and can be a crucial partner regarding the scientific and compliance success of a bank during its active period as well as in perpetuity. The Center for Natural Lands Management (CNLM) partners at multiple stages in the life of a bank - during permitting to determine endowment amounts; during the active period to hold a CE and manage endowment account(s); or as perpetual steward after the bank is sold out and closed.

FEMALE-BIASED SEX RATIO, POLYGYNY, AND PERSISTENCE IN THE ENDANGERED SOUTHWESTERN WILLOW FLYCATCHER

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Conservation and Management of Songbirds
Demographic changes in populations, such as skewed sex ratios, are of concern to conservationists, especially in small populations where stochastic and other events can produce declines leading to extirpation. We documented a decline in one of the few remaining populations of southwestern willow flycatcher in southern California, which dropped from 43 to 12 adults between 2000 and 2012. Declines were unequal between sexes, and adult sex-ratios were female-biased in 8 of 13 years. During this time, the incidence of polygyny in this facultatively polygynous species increased, with males pairing with 2-5 females simultaneously. The proportion of paired males that were polygynous ranged from 0-100% between 2000 and 2012, and varied significantly with the ratio of females to males in the adult population ($p < 0.001$). We investigated the role that nestling sex ratio might be playing in
contributing to the female-biased adult sex ratio by using genetic techniques to determine sex from blood samples collected from 169 nestlings in 71 nests from 2002-2009. Both population-level and within-brood nestling sex ratios were female-biased, and were not influenced by nest order (first or subsequent), parental mating type (monogamous or polygynous), or year. It thus appears that a skewed nestling sex ratio has contributed along with other factors to a female-biased adult population, which in turn has influenced mating behavior. We propose that the capacity for polygyny, which generally occurs at low levels in southwestern willow flycatchers, has allowed this population to persist through a decline that might otherwise have resulted in extinction.

THE ROLE OF SAFE HARBORS IN THE RECOVERY OF LISTED SPECIES IN CALIFORNIA
OR - SHAS - QUIETLY SAVING BUTTLOADS OF LISTED SPECIES
Rick Kuyper; U.S. Fish and Wildlife Service; 2800 Cottage Way, Room W-2605, Sacramento, CA, 95825; 916-212-9335; richard_kuyper@fws.gov

Endangered Species Act Implementation: Successes and Challenges
Safe harbor agreements are agreements between the U.S. Fish and Wildlife Service (FWS) and landowners who carry out management activities on their lands that provide a net conservation benefit to a listed species (e.g., contribute to recovery). The FWS folks in Sacramento have entered into quite a few of these agreements with a variety of private landowners and accomplished some pretty cool stuff. We have partnered with the East Bay Municipal Utility District, Resource Conservation Districts in Alameda and San Joaquin counties, the Natural Resources Conservation Service, Pacific Gas and Electric Company, multiple NGOs and Land trusts, California Department of Fish and Game, and many private landowners to help save California tiger salamanders, California red-legged frogs, bay checkerspot butterflies, Lange’s metalmark butterflies, valley elderberry longhorn beetles, and a crayfish up in Shasta County that hardly anyone has heard of. Through these SHAs, we’ve helped to protect listed species on tens of thousands of acres Many of these agreements work in innovative ways that people don’t often think about. The Sacramento Fish and Wildlife Office would like to explain how we use them, and why we and our conservation partners love them (also animals and plants love them too, which is really what it is all about, right?)

CURRENT STATUS OF THE MOHAVE GROUND SQUIRREL: A FIVE-YEAR UPDATE
Phil Leitner; Endangered Species Recovery Program; California State University, Stanislaus; One University Circle, Turlock, CA, 95382; 925-253-8400; pleitner@pacbell.net

Biology and Ecology of Small Mammals
The state-listed Mohave ground squirrel (MGS; Xerospermophilus mohavensis) has a very limited distribution in the western Mojave Desert. In 2008 I published an account of its status using a comprehensive database derived from unpublished field studies, surveys, and observations contributed by many desert biologists covering the period 1998-2007. With support from the California Department of Fish and Wildlife, I have undertaken an update of this status report based upon 2008-2012 data again provided by a number of colleagues. These data include protocol trapping, regional surveys, camera trapping, and incidental observations. As in the previous 10 years, protocol trapping has been concentrated in the southern portion of the species range and adjacent areas. The great majority of protocol trapping efforts have failed to detect MGS. Regional surveys have confirmed MGS populations in the four core areas identified in the 2008 report. Large-scale camera trapping has documented MGS occupancy in several areas where there was little recent information. In particular, the postulated corridor from Edwards Air Force Base north to Ridgecrest supports a significant MGS population. The camera study also provided evidence of MGS occupancy in the northern Searles Valley and from Kramer Junction eastward toward Hinkley. However, extensive sampling over the past 15 years suggests that the species is absent from much of the
southern portion of the historic range. There are still extensive areas on China Lake Naval Air Weapons Station and Fort Irwin where little sampling has been done and the status of the species is uncertain.

**THE ROLE OF MIGRATION CORRIDORS FOR THE ENDANGERED HAWAIIAN GOOSE**  
Christina Leopold; Hawaii Cooperative Studies Unit; PO Box 44, Hawai’i Volcanoes National Park, HI, 96718; 808-985-6406; cleopold@usgs.gov; and Steven C. Hess  

*Island Ecosystems and Wildlife Management*  
Movement corridors are important for animals because they allow for migration and dispersal among suitable habitats widely distributed across landscapes. The use of corridors and stopover sites may differ among intratropical altitudinal migrants, long-distance migrants capable of flying over unsuitable habitats, and non-volant animals which need contiguous suitable habitat to complete migration. Brownian bridge movement models (BBMMs) are a relatively new method for estimating utilization distributions of migratory animals across landscapes. We used BBMMs to characterize how the endangered Hawaiian Goose (*Branta sandvicensis*), an intratropical altitudinal migrant, moves across the landscape on Hawai’i Island by analyzing migration events, identifying important movement corridors and habitat characteristics associated with stopover sites, and understanding the degree of corridor overlap between two breeding subpopulations that were previously isolated from each other. We found well-defined common movement corridors over a broad altitudinal gradient within diverse habitats, but stopover sites primarily occurred at the confluence of movement between the two subpopulations in native-dominated subalpine shrublands and water features. Additionally, we found no relationship between migration distance and number of stopover sites, suggesting that social interactions may be a more important factor affecting the use of stopover sites than a need for refueling enroute.

**STATUS AND NESTING ECOLOGY OF PURPLE MARTINS AT SHASTA LAKE, CALIFORNIA**  
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*Conservation and Management of Songbirds*  
The western purple martin (*Progne subis arboricola*) is a local and rare breeder in California and currently designated as a bird species of special concern by the California Department of Fish and Game. Shasta is one of only a few regular purple martin breeding locations occurring in interior northern California. Purple martins have been known to nest at Shasta Lake since at least 1978, but no regular population monitoring has occurred. To support reservoir planning activities a monitoring effort began in 2007 to evaluate the purple martin distribution, status, and nesting habitat characteristics. Results show numbers of breeding pairs have increased over the monitoring period and a recent proportional shift of nest sites located in flooded areas to upland sites. The upland nest sites are concentrated in an area subjected to recent wildfires. When compared to previous surveys, the monitoring results indicate the purple martin population at Shasta Lake is stable and overall increasing. This population is an important component of the interior northern California purple martin population, as based on recently developed population estimates, Shasta Lake represents between 21% and 76% of the overall purple martin population in California’s Cascade region.
The Endangered Species Act, Conservation Banking and Related Tools for Mitigating Impacts to Wildlife
The Delhi Sands Flower-Loving Fly is the only fly on the federal endangered species list. This subspecies is restricted to the Delhi Sands formation, an area of ancient inland dunes of which only a few hundred acres out of more than 40 square miles (100 km²) remain in the towns of Colton, Fontana, and Ontario, California. In this rapidly growing area of Southern California, the conflict between development and protection of this species is intense. Establishment of a conservation bank for this species was a challenge because the proposal by Vulcan Materials Company (Vulcan) to protect and restore approximately 160 acres of a portion of this dunes system met with resistance from the U.S. Fish and Wildlife Service (Service). For several years, the negotiations were unsuccessful but development pressure and looming threats to the species forced Vulcan and the Service to persevere and work together. An innovative approach and incredible teamwork between Vulcan and the Service resulted in the successful establishment of the bank.

Using Bird Monitoring Results to Plan and Assess Meadow Restoration in the Sierra Nevada
Conservation and Management of Songbirds
Anthropogenic changes have altered hydrology and vegetation at many Sierra Nevada meadows, often diminishing the value of meadow habitat for native bird populations. However ongoing meadow restoration efforts throughout the Sierra Nevada have great potential for bolstering populations of meadow-associated birds, and population responses of meadow-associated birds can provide excellent indicators of restoration success. In 2010 we designed a bird monitoring protocol specific to meadow restoration efforts that incorporates: point counts, area searching, and vegetation characterization. We identified 18 focal bird species to prioritize for restoration planning and outcome assessment. In 2010 we initiated monitoring at 30 meadows identified for future restoration and 30 associated reference meadows using a BACI framework. In 2012, we repeated monitoring visits at a subset of these (5 restored since 2010 and 10 still unrestored) and at 15 newly identified pre-restoration sites. Our study sites include restoration projects throughout the Sierra Nevada and southern Cascades under a variety of ownerships. Preliminary results indicate that despite the varied nature of meadows and meadow restoration plans, bird monitoring is providing valuable insight to restoration planning and the assessment of restoration outcomes.

Stable Mitochondrial Variation in a Declining Population: A 135-Year Genetic Survey of Buff-Breasted Sandpipers
Ecology and Management of Shorebirds
The maintenance of genetic variation has been a cornerstone for management efforts across a wide range of threatened taxa. Modern and historic processes that limit population size can contribute to the loss of genetic
variation. Like many species of migratory shorebirds, Buff-breasted Sandpipers ($P = 0.679$). We did not observe a loss of pervasive haplotypes, implying that there was no substantial loss of unique taxonomic units during our study period. Using estimates of female effective population size ($N_e$) and Bayesian Skyline reconstruction of effective population size, we concluded that $N_e$ was also stable during our study period. While mitochondrial variation and $N_e$ did not appear to have been reduced to critical levels as a result of population losses in Buff-breasted Sandpipers, management efforts must focus on preventing future losses for wild populations to remain viable.

**RECREATIONAL INCOME ON FARMS AND RANCHES: IMPLICATIONS FOR LAND USE CHANGE**

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**Student Paper**

**Grazing, Agriculture and Wildlife Conservation**

Land use change is a primary driver of habitat loss and a major threat to wildlife species worldwide. Understanding the economic drivers of land use is vital to conservation. Rangelands are generally undeveloped and environmentally important areas that are most prone to environmental degradation by conversion to other land uses. This research seeks to determine how economic return of recreational uses from different agricultural sectors influences the conversion of rangelands into intensive agricultural production or residential development. The academic literature has not evaluated the role that recreational income plays in land use change on a national level and this analysis seeks to elucidate this relationship. The USDA Agricultural Resource Management Survey annually gathers detailed economic data from the agricultural sector. My research uses this dataset to understand the role of recreational income in land use change with a particular focus on rangelands. Recreational income may be complementary with existing agricultural operations, or farmers and ranchers may substitute recreational income in place of normal operations. The extent to which recreational income is a complement or a substitute for farming and ranching operations will be a guide to whether recreational income accelerates or slows conversion of rangelands to other uses.

**SHORT-TERM BIRD AND SMALL MAMMAL RESPONSE TO FUEL REDUCTION TREATMENTS IN THE LAKE TAHOE BASIN**

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**Upland Habitats, Game Birds and Wildlife**

Fire suppression over the past century has resulted in high and potentially dangerous fuel loading in many western forests, which poses threats to both forest health and human infrastructure. To reduce risks from high-intensity wildfires, fuel reduction treatments are being implemented on both state and federal lands in the Tahoe Basin. In this project, we employed a Before-After Control-Impact design on 16 sites (8 pairs of treatment and control sites) to assess the response of birds and small mammals to fuel reduction treatments. Using sites which encompassed a variety of treatment prescriptions, we collected data on bird and small mammal abundance, as well as forest structure, from 2006 to 2011. We analyzed wildlife response to changes in forest structure at both the community and species levels. While bird and small mammal community composition changed in response to treatment, our results suggest that community diversity and evenness were not significantly affected by fuel treatments at our sites. However, we did observe significant changes in abundance of several species, particularly those species dependent on shrub and ground-level vegetation. Given planned wide-scale implementation of fuel treatments within the West, our results will allow managers to better predict the impacts of future fuel treatments.
THERMAL REGIMES OF EIGHT INTENSIVELY MONITORED PIKA (OCHOTONA PRINCEPS) TALUSES, SIERRA NEVADA, CA, 2009-2012

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Climate Change and Wildlife: Managing Moving Targets
To explore thermal regimes relevant to climate change and habitat of American pika we conducted a 4-yr study on 8 taluses in the Sierra Nevada, California. The design included low and high elevation sites, north- and south aspects, and granitic and metamorphic substrates. Thermochrons were deployed in 4 contexts at each site: talus surface, talus matrix, forefield (ground), and 2.5 m in trees. We aligned 4 transects 120 m uphill at each site and along each installed forefield plots, and low, mid, and high talus plots, each of the latter with surface and matrix positions, and 1-2 trees per talus. Significant findings included: matrix temperatures were cooler than surfaces in summer and warmer in winter; matrix positions had smaller diurnal temperature fluctuations than forefield and talus surface positions; positions near the talus base were cooler than high; elevation, aspect, and substrate had significant interactions. Daily and seasonal lags between matrix and external air suggest complex patterns of thermal resistance within the matrix. Comparing talus matrix to external air as well as to temperatures modeled from PRISM suggests partial decoupling of talus from ambient thermal regimes. Taluses appear to be important climate refugia for pikas as regional temperatures warm.

CYANOTOXIN (MICROCYSTIN)-ASSOCIATED MORTALITY OF THREATENED SOUTHERN SEA OTTERS: PATHOLOGY AND DEMOGRAPHY OF A PUTATIVE ANTHROPOGENIC POLLUTANT

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Wildlife Diseases and Pathology
Cyanobacteria, formerly called blue-green algae, thrive in warm, nutrient-enriched, anthropogenically-degraded watersheds worldwide. Under optimal conditions, these primitive bacteria can form super-blooms that release high concentrations of environmentally persistent cyanotoxins into adjacent water. These potent toxins can biomagnify through local food webs and spread from their point of origin, killing downstream animals and posing human health risks. At present, over 30 stranded Southern sea otters, a state and federally protected threatened marine mammal that is found only in California, have tested positive for the potent cyanotoxin, microcystin. Many of these otters died due to acute liver failure, but additional lesions were also identified. At present, no marine source of microcystin has been identified locally; the otters appear to have been poisoned either through contact with microcystin-contaminated freshwater runoff, or consumption of marine filter-feeders, such as mussels, that can bioconcentrate and retain microcystin toxin in their tissues. Because humans consume many of the same prey items, our preliminary findings raise concern regarding potential unrecognized human health risks.

In this presentation we will review the demographical patterns for microcystin-positive sea otters, and review the gross and microscopic lesions that are indicative of microcystin intoxication in sea otters, domestic animals and humans.
SURVIVAL OF REINTRODUCED CALIFORNIA CONDORS IN BIG SUR, CALIFORNIA

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Ecology and Management of Raptors

The California Condor (Gymnogyps californianus) population historically experienced severe losses, prompting the complete removal of the species from the wild in 1987. A successful captive breeding effort allowed reintroduction of captive-born condors in southern California starting in 1992. Starting in 1997, Ventana Wildlife Society released 47 condors in Big Sur, California. Seventeen (36%) released condors died in the wild in 1997-2010. We calculated an overall annual survival of 93.3%; slightly higher than survival reported for condors in Arizona in 1996-2005. Annual survival was 83.5% for condors in the first year following release and 97.0% for condors ≥5 years following release. Power lines and lead were the leading sources of mortality, although mitigation efforts have reduced the power line threat in recent years. Six condors were treated by chelation therapy for lead levels ≥ (greater than)100 µg/dL. Under a hypothetical scenario of fatality at lead levels ≥ (greater than)100 µg/dL, annual survival dropped to 89.9%. Treatments may have improved survival, and the 2008 ban of lead ammunition in California’s condor range is expected to reduce future risk of lead exposure. Establishment of a viable, self-sustaining condor population in central California will depend on a low level of exposure to lead.

NRCS SAGE-GROUSE INITIATIVE (SGI): TARGETED APPROACH TO LANDSCAPE CONSERVATION

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Upland Habitats, Game Birds and Wildlife

As part of the NRCS Sage-Grouse Initiative (SGI), NRCS California has continued to work with ranchers and agency partners to conserve greater sage-grouse populations and sustain working ranches. Starting in 2010, NRCS began offering additional technical and financial assistance to ranchers across 11 states to reduce threats common to sage-grouse conservation and sustainable ranching. Our science-based landscape approach targets conservation actions to address sage-grouse resource concerns near core breeding density areas. In addition to cost sharing on management, structural, and vegetative practices to address these threats, NRCS has been working with private landowners interested in selling conservation easements to protect critical sage-grouse habitats. Some of these easements are completed with matching funds from non-federal partners. These working ranches provide essential breeding habitat and complement restoration activities by other partners across the range of the sage-grouse. The SGI has been a model for NRCS in targeting limited resources addressing landscape issues across the country. In cooperation with other state, federal and non-government partners, NRCS has significantly increased the available technical assistance across the eleven states to work directly with ranchers and farmers on new and existing conservation plans and contracts, ensuring ranchers have an ongoing partnership available to meet their needs.
EXPLORING OUTCOME OF BEHAVIORAL AND ECOLOGICAL INTERACTIONS BETWEEN TWO WOODRAT SPECIES IN CONTACT IN COASTAL CALIFORNIA

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**Biology and Ecology of Small Mammals**

When closely related species come into contact, similar ecologies may result in competition for food. Selection to reduce competition may favor displacement in diet that arises from differences in foraging abilities, or from behavioral dominance (territoriality), or a combination of these processes. We looked for evidence of such displacement in a contact zone between *Neotoma fuscipes* and *N. macrotis* in the coast range of California. We compared the diets across the contact zone using stable isotopes from hair, from allopatry (Nf) to sympatry to allopatry (Nm). Across the same transect we quantified the vegetative community. We also conducted behavioral trials to assess differences in dominance that may enable one species to exclude the other from a preferred resource. We found no significant differences in the plant community across the transect, but isotopic nitrogen indicated diet displacement from outside to within the zone of contact. *N. fuscipes* was more dominant in behavioral trials and also exhibited a greater shift in diet when in contact, becoming more herbivorous based on isotopic values. Our findings suggest that the larger *N. fuscipes* may behaviorally interfere with the smaller *N. macrotis* when the two species come into secondary contact.

BANK SWALLOW COLONIES ALONG SIERRA STREAMS: MAPPING PLUMAS COUNTY LOCATIONS

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**Conservation and Management of Songbirds**

Bank swallow (*Riparia riparia*), a colonially nesting neotropical migrant, is a California state-threatened species. While the majority of California’s bank swallow population nests in the Central Valley along the Sacramento and Feather Rivers, the species also nests in coastal and mountain areas, in burrows along vertical faces of friable soils. Over a four-year period we located and mapped 24 distinct colonies in Plumas County along several different creek systems tributary to the North Fork Feather River. Occupancy was estimated by adapting occupancy rates developed in separate studies along the Sacramento River and by counting bids on site. We estimated that between 300 and 450 breeding pairs were using the nesting sites. Colonies were largely associated with incised and downcut stream systems that have been affected by historical land use practices such as mining, channelization, deforestation and grazing. Mapping bank swallow colonies is a task well-suited to “citizen-science” due to the visibility of birds and ease of identification of nest sites. More colonies may be mapped in the future by working with the local birding community and analyzing air photos.

ESTIMATING NESTING PROPENSITY IN FEMALE GREATER SAGE-GROUSE: A MULTISTATE APPROACH

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**Upland Habitats, Game Birds and Wildlife**

Previous reports of greater sage-grouse (*Centrocercus urophasianus*) nesting propensity have been estimated by dividing the number of nests found from unique females by the number of females monitored. Although easy to calculate, this method cannot account for nests missed by observers due to nest failure prior to detection or female
mortality during the nesting season. Additionally, comparisons of these estimates between studies are not valid due to inconsistencies in field monitoring protocols. We developed a methodology to directly estimate nesting and re-nesting propensities which account for the bias associated with apparent nesting propensity estimates. We analyzed 10 years of female radio-marked sage-grouse telemetry and nesting data from Eureka County, Nevada using a multistate framework in Program MARK to estimate probabilities of nesting propensity, nest failure and nest detection. Preliminary results suggest substantial annual variation in female nesting propensity (0.52 - 0.92) and a significant positive relationship between female age on nesting propensity ($\hat{p} = 0.21$, 85% C.I. 0.11 - 0.30). Additionally, methodologies that located females every three days were three to eleven times less likely to miss a nest that initiated but failed before detection than methodologies that located females once a week.

THE LAND-SEA CONNECTION: EPIDEMIOLOGY AND ENVIRONMENTAL LOADING OF CRYPTOSPORIDIUM AND GIARDIA IN DOMESTIC AND WILD ANIMALS ALONG THE CENTRAL CALIFORNIA COAST

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Wildlife Diseases and Pathology
Risk of disease transmission from waterborne protozoa is often dependent on origin (e.g., domestic animals versus wildlife), overall parasite load in contaminated waterways, and parasite genotype; with infections being linked to runoff or direct deposition of domestic animal and wildlife feces. Fecal samples collected from domestic animals and wildlife along the central California coast were screened to 1) compare prevalence and associated risk factors for fecal shedding of Cryptosporidium and Giardia spp. parasites; 2) evaluate relative importance of animal host groups that contribute to pathogen loading in coastal ecosystems; and 3) characterize zoonotic and host-specific genotypes. Overall, 6% of fecal samples tested during 2007-2010 were positive for Cryptosporidium oocysts, and 15% were positive for Giardia cysts. Fecal loading analysis revealed that infected beef cattle potentially contribute the greatest parasite load relative to other host groups, followed by wild canids. Beef cattle, however, shed host-specific, minimally zoonotic Cryptosporidium and G. duodenalis genotypes, whereas wild canids shed potentially zoonotic genotypes, including G. duodenalis assemblages A and B. Given that the parasite genotypes detected in cattle were not zoonotic, the public health risk posed by protozoal parasite shedding in cattle feces may be lower than for other animals that routinely shed zoonotic genotypes.

BILINGUAL OUTREACH: AN IMPORTANT TOOL IN URBAN WILDLIFE MANAGEMENT

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Urban Wildlife, Management and Emerging Issues
The protection of isolated populations of listed species of plants and/or wildlife becomes quite challenging when these populations are surrounded by large metropolitan areas. Development pressure on these populations isn’t the only threat to their long-term viability. Impacts from human uses, such as recreation, can also be a major threat. Educating the public about the importance and sensitivity of the resources is necessary but it can be quite challenging. The protection measures associated with managing mitigation areas, wildlife refuges, and/or parks and those that are implemented during the monitoring of construction projects are usually targeted at English-speaking individuals. However, in California and the southwest, a large proportion of the visitors or recreationists that visit mitigation areas, wildlife refuges, and/or parks are Spanish-speaking. Similarly, many equipment operators and construction workers are also Spanish-speaking. In many instances, the Spanish-speaking individuals have no idea of the consequences of their actions on the sensitive resources because the message has
not been conveyed in their native language. Conducting on the ground education programs with Spanish-speaking biologists and creating bilingual brochures and construction briefing pamphlets has resulted in creating a whole new group of stewards for these isolated populations of listed species.

**INSECT SAMPLING TECHNIQUES AS PART OF A BASELINE INSECT SURVEY FOR A UTILITY SCALE ALTERNATIVE ENERGY PROJECT**

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**Renewable Energy and Wildlife – Managing a Balance**

In the spring of 2011, a baseline survey for arthropods that included insects and arachnids was conducted outside the location of a proposed utility scale alternative energy project site in the vicinity of Desert Center, California. The sampling area is located within an ecotone of the Mojave and Sonoran deserts. Sampling locations were selected based on habitat type that focused on locations within desert wash woodland and creosote-burro bush habitat. Both daytime and nighttime sampling using sampling techniques for both aerial (flying) and terrestrial insects was completed. A total of 265 families of insects and arachnids were sampled.

**PEREGRINE FALCON NESTING ECOLOGY ON THE CALIFORNIA CHANNEL ISLANDS**

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**Island Ecosystems and Wildlife Management**

Since 1987, the breeding Peregrine Falcon (*Falco peregrinus anatum*) population on the California Channel Islands has steadily increased after having been extirpated by the early 1950s, probably by DDE-induced eggshell thinning. Prior to 1947, the species nested on at least 6 of the 8 Channel Islands. We documented nesting and site-specific ecology at 30 of 38 known nest sites, representing 6 of the islands, with additional information collected in 2008, 2010, and 2012. In 2007, at least 16 pairs successfully hatched eggs, producing 35 young, of which 26 individuals were color-banded. We collected samples of prey remains (n = 21) and eggshell fragments (n = 41) during 37 nest entries. Documented prey included 48 avian species, and Red Phalaropes (*Phalaropus fulicarius*) were the most common prey. Eggshells averaged 18.3% thinner than the pre-1947 (pre-DDT) mean, a level that is considered too high to support a self-sustaining population. The Channel Islands population is presently being supplemented by the immigration of peregrines from the nearby mainland, and a male that fledged from a nest on Santa Rosa Island in 2007 became a member of a territorial pair on the California coast in 2012.

**SEMI-COLONIAL NESTING BY THE SNOWY PLOVER**

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**Ecology and Management of Shorebirds**

Snowy Plovers (*Charadrius nivosus*) have been characterized as nesting in “loose colonies.” The goal of this paper was to determine whether Snowy Plovers breeding in coastal northern California (near the northern limit of their range) nested semi-colonially in any or all of 12 years (2001-2012) and to investigate which ecological mechanisms could have been responsible for the observed pattern. This study combined remote sensing and statistical permutation tests to characterize nest dispersion at a landscape scale. We found that plovers nested semi-colonially in half the years; semi-colonial years were years with high population size. Plovers nested an average of 1284 +/- 4019 m from their nearest neighbor, with a minimum of 20 m and a maximum of 41 km.
Distance to nearest neighbor was not a significant predictor of fledging success. Individual males that nested in the study area for more than one year were not consistent in their distance to nearest neighbor, likely because once a pair commits to a nest site (and lays eggs) they probably do not have much control over where another pair places their nest.

**THE NORTH AMERICAN PIKA (OCHOTONA PRINCEPS) AND CLIMATE CHANGE: A RESEARCH CONSORTIUM APPROACH TO ASSESSING EXTINCTION RISK**

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**Biology and Ecology of Small Mammals**

The North American pika (*Ochtona princeps*), a thermally sensitive alpine lagomorph found in high elevation talus habitats in western North America, may be one of the first casualties of global climate change. In 2007, the Center for Biodiversity petitioned the State of California and USFWS to list the pika as endangered due to temperature increases associated with global climate change. Both petitions were denied but this effort spurred the formation of the California and North American Pika Consortia in 2009 and 2010. These groups are comprised of state and federal agency, NGO, and university researchers who through an interdisciplinary collaborative effort are fostering research, monitoring, education, conservation, and adaptive planning for pikas in order to document declines throughout their range and identify environmental correlates of both population persistence and loss. Recent research has involved various approaches including species distribution modeling, ecological niche modeling, historic revisits, habitat quality assessment, time series data, and bioenergetics models. Here I discuss an approach to assess whether climate change has influenced the maintenance of genetic variation and movement potential within and among populations by comparing patterns of dispersal and population genetic structure observed for three populations in the Sierra Nevada first surveyed 24 years ago.

**GOLDEN EAGLE POPULATION DEMOGRAPHICS AND NATAL DISPERSAL IN WESTERN NEVADA**

*Katie Quint; Wildlife Research Institute; 18030 Highland Valley Rd, Ramona, CA, 92065; 760-789-3992; kquint@wildlife-research.org; John D. Bittner, Chris B. Meador and Marcus A. Collado*

**Ecology and Management of Raptors**

Golden eagles (*Aquila chrysaetos*) have gained recent attention due to documented population decline. Ground and helicopter surveys in Clark, Washoe and Storey counties by Wildlife Research Institute identified 69 golden eagle territories with an average of 1.54 young per productive territory. Satellite telemetry units were applied to nestling golden eagles (*n = 17*) in Clark, Washoe and Storey Counties, Nevada. Long-term dispersal from the natal area occurred on average at 0.42 ± 0.25 years old. Of the sample, 53% died within the first 1.5 years. Mortality data were cataloged and on-site investigations were performed. Currently, 7 telemetry units remain on live eagles and are returning active flight data, the oldest of which has been deployed for 2.42 years. Flight path data indicate that Western Nevada-born golden eagles use the Sierra Nevada Mountain Range in California as a West-most boundary for dispersal. High frequency of dispersal routes occurred along the Nevada-California border on a generally North-to-South axis. Changes in flight direction occurred between Central Oregon and Northern Nevada for all northbound flight paths in that area. A cooperative golden eagle management strategy among the political jurisdictions within this range of dispersal is recommended to address direct and indirect human-imposed mortality issues faced by Western Nevada’s golden eagles.
LOCAL AND LANDSCAPE HABITAT ASSOCIATIONS OF NON-BREEDING SHOREBIRDS IN SAN FRANCISCO BAY

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Ecology and Management of Shorebirds
San Francisco Bay Estuary (SF Bay) annually provides habitat for more than one million shorebirds. The scale at which shorebirds associate with habitat features within SF Bay is poorly known but this information is needed for optimal conservation. We used data from annual, high-tide, comprehensive surveys of SF Bay during November 1990-92 and 2006-08 with GIS habitat data to model factors influencing shorebird use and assess the relevant spatial scales. We calculated the area of tidal flat, salt pond, tidal marsh, and “high intensity” urban infrastructure in the survey unit and within 2-, 5-, 10-, and 20-km buffers around the survey unit as covariates. Our data suggest that *Calidris* sandpipers, Black-necked Stilt, and American Avocet were associated with small scale (5-km buffers or less) availability of tidal flats and salt ponds. Long-billed Curlew, Marbled Godwit, and Willet responded to habitat at larger spatial scales (>5-km buffers) and were positively associated with tidal marsh, but negatively associated with salt ponds. Our results suggest that distribution and abundance of multiple habitats should be considered to manage for a diversity of shorebirds in SF Bay. Ongoing assessment of these models will be conducted with annual data from the Pacific Flyway Shorebird Survey.

THE PREWETT FAMILY PARK BURROWING OWL PRESERVE: A MODEL FOR URBAN BURROWING OWL CONSERVATION

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Urban Wildlife, Management and Emerging Issues
In 2009, the City of Antioch established the Prewett Family Park Burrowing Owl Preserve to compensate for the loss of 5.2 acres of burrowing owl habitat associated with the construction of the nearby Antioch Community Center. The preserve is comprised of 24 acres of undeveloped annual grassland in the northern portion of the 98.5-acre Prewett Family Park, and contains abundant California ground squirrel burrows. Annual monitoring consists of four visits to evaluate habitat conditions and census owls: one in the winter (December-January) and three throughout the breeding season (February 15 - July 15). During the first four years of monitoring, the maximum number of adults ranged from only 1 in 2009 to 10 in 2012. Breeding was not observed in 2009 but has been confirmed the last three years with 12, 9, and 26 juveniles observed in 2010, 2011, and 2012, respectively. Despite surrounding development and moderate disturbance levels, the preserve currently supports several breeding owl pairs and demonstrates the efficacy of urban habitat preservation if management needs are met. Several Antioch residents were also instrumental in preserve establishment and continue to provide much-needed public support and outreach, which is crucial for the long-term persistence of urban owl populations.
RESULTS OF LONG-TERM GOLDEN EAGLE POPULATION SURVEYS ACROSS SEVEN COUNTIES IN SOUTHERN CALIFORNIA

Renée Rivard; Wildlife Research Institute; 18030 Highland Valley Rd, Ramona, CA, 92065; 760-789-3992; rrivard@wildlife-research.org; John D. Bittner, John Oakley, Chris B. Meador, Marcus A. Collado, James Hannan, Katie R. Quint and Kate Spier

Ecology and Management of Raptors
The Wildlife Research Institute (WRI) has been surveying and monitoring Golden Eagles (Aquila chrysaetos) in Southern California for over 24 years and has collected historical data on many territories that date back to the 1800s. Data collected via ground and aerial surveys on more than 225 territories across San Diego, Imperial, Orange, Riverside, San Bernardino, Kern and Inyo counties will be summarized. Territories ranged from 93 km² (36 mi²) in the California coastal sage and chaparral habitats of the Peninsular Ranges to 347 km² (134 mi²) in the upland and dry wash woodland areas of the Sonoran Desert. Initial analysis of the data has begun to show that coastal territories, which were once numerous began facing extirpation in the 1970s and disappeared mainly as a result of urbanization, while the inland mountain and desert territories continue to be affected by drought and frequent wildfires and threatened by agricultural development and human recreational activities.

SUPERNUMERARY DIGITS AND SYNDACTRYLY IN A SWAINSON’S HAWK (BUTEO SWAINSONI)

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Wildlife Diseases and Pathology
A recently fledged Swainson’s hawk was found grounded near its nest in Modoc County, California in August 2012. The local wildlife rehabilitation facility was contacted by the property owner and retrieved the hawk. During evaluation, it was noted that the hawk had abnormalities of the legs and feet that affected the birds’ ability to stand, perch, and grasp prey. The hawk presented with two extra digits on the right leg and one extra digit on the left leg. The digits were non-functional and attached to the tibiotarsus just proximal to the tarsometatarsus. Additionally, the digits of both feet exhibited some degree of syndactyly. Due to the severity of the abnormalities, the hawk was euthanized and submitted for necropsy and testing. Congenital abnormalities, similar to these, have been previously attributed to genetic and/or environmental causes. Given the life history of the Swainson’s hawk, the role of a potential genetic bottleneck caused by population decline and possible exposure to contaminants are discussed. In California, Swainson’s hawks have been listed as a state threatened species since 1983 due to significant population decline. Furthermore, there have been reports of mortality of Swainson’s hawks on their wintering grounds in South America attributed to the use of pesticides. While the use of extremely hazardous pesticides have declined in recent history, it’s possible hawks are exposed to cumulative effects of pesticides both in their breeding grounds in California and their wintering grounds in South America, either through the hawk’s use of agriculture for foraging, or through consumption of affected prey.

CURRENT ISSUES IN LISTING AND RECOVERY UNDER THE ENDANGERED SPECIES ACT: A TALE OF THREE CRITTERS

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Endangered Species Act Implementation: Successes and Challenges
This presentation uses ongoing controversies involving three species to illustrate current issues under Section 4 of the Endangered Species Act. Despite bald eagles delisting in 2007, conservation groups continue to seek
Abstracts for Oral Presentations Sorted Alphabetically by Author

**Western Section of the Wildlife Society**

**2013 Annual Conference**

**Technical Sessions**

Protection of an isolated population of bald eagles inhabiting the Sonora Desert in Arizona and northern Mexico. The U.S. Fish and Wildlife Service’s refusal to protect this population highlights controversy over when the ESA can protect populations.

Also for a Southwest species, FWS is drafting a recovery plan for Mexican wolves. The recovery team is struggling with a fundamental issue: can a species be considered “recovered” under the ESA when ongoing human intervention is necessary to maintain the viability of the species, or must a species be able to persist on its own even though this would require protection of more land and more connecting corridors?

Finally, a recent decision by the District of Columbia Court of Appeals upheld a decision by FWS to remove Virginia northern flying squirrels from the ESA’s protected rolls even though the population had not met the recovery plan’s explicit goals. Is this really OK?

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**CASCADING IMPACTS ON AMPHIBIAN ASSEMBLAGES IN RESTORED WETLANDS**

**Jennifer Rowe**; Oregon State University Department of Fisheries and Wildlife; 104 Nash Hall, Corvallis, OR, 97331; 248-767-5070; jennifer.rowe@oregonstate.edu; and **Tiffany S. Garcia**

*Student Paper*

**Conservation and Biology of Amphibians and Reptiles**

Novel interactions that arise within disturbed habitats pose a unique challenge to restoration. The objective of this study was to determine whether intensity of invasive plant management (active or passive) and presence of invasive species produces cascading effects on amphibian assemblages in restored wetlands. We documented biodiversity and vegetative cover at 29 sites enrolled in the Wetlands Reserve Program in Oregon’s Willamette Valley. Multivariate statistical methods were employed to evaluate the relative importance of interacting biotic and abiotic factors thought to influence amphibian abundance. Actively managed wetlands had significantly less cover by invasive plant species (Welch’s two-sample t-test; \(t(14.09) = -2.79, P = 0.01\)) compared to passively managed sites. However, management intensity was not found to be an important predictor of amphibian abundance and diversity at the local (wetland) scale. Instead, best generalized linear models inferred by Akaike’s Information Criterion indicated that the presence of non-native fish is a strong predictor of bullfrog (positive effect) and native anuran (negative effect) abundance. When broad spatial scale models were considered, landscape management appeared to be an influential factor. The relative importance of landscape variables varied among species and life stages, and this may reflect species-specific differences in dispersal capabilities and habitat requirements. This study elucidates the synergistic stressors placed on native amphibians and emphasizes the importance of holistic approaches to maintaining diverse communities.

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**DUSKY-FOOTED WOODRAT (NEOTOMA FUSCIPES) ECTO-PARASITE LOADS IN RELATION TO DEMOGRAPHIC AND ENVIRONMENTAL FACTORS (PRELIMINARY RESULTS)**

**Austin Roy**; University of California Berkeley; 2060 Trailblazer Way, Castle Rock, Co, 80109; 9492918735; a.roy4@yahoo.com; William D. Tietj

**Wildlife Diseases and Pathology**

An understanding of host-parasite relationships is important for the management of host species and for public health concerns. During 14 spring and fall live-trapping sessions conducted in an oak (Quercus spp.) woodland during 2006-2012, we indexed the abundance of fleas, botfly warbles, and ticks on approximately 4,000 individual dusky-footed woodrats (Neotoma fuscipes). For the 14 trapping sessions, mean parasite prevalence was 31% of captured woodrats, with a low of 17% and high of 40%. Parasite abundance generally followed host abundance, i.e., the more woodrats the more ectoparasites. Woodrat mass was negatively correlated with both the prevalence of parasites and the number of groups of ectoparasites (tick, flea, warble) on a woodrat. Juvenile woodrats carried more parasites than other sex/age groups. We did not detect an effect on parasite load of season.
Research such as this may yield insight into the interplay between parasites, hosts, and a changing environment.

AN UPDATE ON THE SIERRA NEVADA RED FOX POPULATION NEAR SONORA PASS

Ben Sacks; UC Davis; One Shields Avenue, Davis, CA, 95616; 530-754-9088; bnsacks@ucdavis.edu; Chris Stermer, Cate Quinn, Mark Statham, Preston Alden, Kathleen Miles, Adam Rich, Joan Lowden and Esther Burkett

Ecology and Management of Large Mammals and Carnivores
Montane red foxes (Vulpes vulpes) are restricted to the highest elevations of western US mountain ranges and have declined in abundance over the past several decades. This talk addresses the most endangered subspecies, the Sierra Nevada red fox (V. v. necator), which occurred historically throughout the high elevations of California’s Sierra Nevada and southern Cascade Mountains (including Oregon), but declined precipitously during the late 1900s. The subspecies status is poorly known in Oregon, but has been detected recently near Mt. Hood, Crater Lake NP, and at a location in between. The Sierra Nevada red fox currently occurs in only two known isolated remnant populations in California: the “Lassen population,” estimated at <20 breeding individuals, and >100 km to the south, the “Sonora Pass” population, thought extirpated until August 2010, when a native red fox was detected there. Since this rediscovery, we have conducted follow-up snow-tracking, camera surveys, and noninvasive genetic sampling of this population to better assess its size and extent. An update on findings is presented, including minimum numbers of individuals, range extent, spatial relations to coyotes, and genetic and resampling indicators of population size. Implications are discussed in the context of continuing research, hurdles, and conservation concerns.

THE CONSULTATION PROGRAM AT 40: A REGIONAL PERSPECTIVE

Larry Salata; U.S. Fish and Wildlife Service; Pacific Regional Office, 911 NE 11th Ave., Portland, OR, 97232; 503-231-2350; larry_salata@fws.gov

Endangered Species Act Implementation: Successes and Challenges
From its inception, the FWS has recognized the importance of interagency collaboration to successfully achieve the conservation objectives of the ESA section 7 program. The extent and manner of that collaboration have been evolving over the last 40 years in response to the FWS’s accumulated program experience, case law, a steadily increasing and complex workload, and expanding opportunities for using the internet. This presentation will discuss these factors in the context of the important role that the Consultation Program plays in the recovery of listed species.

DEVELOPING CONSERVATION BANK SERVICE AREAS FOR THREATENED AND ENDANGERED SPECIES

Kenneth Sanchez; US Fish and Wildlife Service; 2800 Cottage Way W-2605, Sacramento, CA, 95825; 916-414-6671; kenneth_sanchez@fws.gov

The Endangered Species Act, Conservation Banking and Related Tools for Mitigating Impacts to Wildlife
This talk describes approaches for developing conservation bank Service Areas for species listed under the Federal Endangered Species Act (ESA). Service Area is defined as, “the geographic area in which credits from a conservation bank may be used to offset impacts to certain listed species.” Conservation biologists have long recognized the need to maintain a species over the widest range possible relative to its historic distribution. The ESA also recognizes the importance of range and its loss as an important factor when considering whether to list a
species as threatened or endangered. The goal when developing a service area would be to maintain the range of
the species relative to and considering the likely impacts from permitted habitat loss. Service areas for the giant
garter snake (*Thamnophis gigas*), California tiger salamander-Central California Distinct Population Segment
(DPS) (*Ambystoma californiense*), vernal pool tadpole shrimp (*Lepidurus packardi*), and the California red-
legged frog (*Rana draytonii*), have been developed using various levels of information including genetic data,
historic and current distribution, historic and current geographic barriers, dispersal capability of the species,
recovery objectives, high impact and habitat loss areas, and market demand.

**TRANSLOCATION OF CALIFORNIA RED-LEGGED FROG TO RESTORED CRITICAL HABITAT, SOLANO
COUNTY. METHODS, CHALLENGES, AND PRELIMINARY RESULTS**

Robert Schell; WRA, Inc.; 2169 East Francisco Blvd. Suite G, San Rafael, CA, 94901; 415-454-8868x149;
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**Student Paper**

**Conservation and Biology of Amphibians and Reptiles**

California Red-legged Frog (*Rana draytonii*): CRLF is a federally threatened species and considered a California
Species of Special Concern. Historically, efforts have focused on preservation and restoration of occupied
habitats. However, little has been done with amphibian translocations to unoccupied habitat as a recovery tool for
listed species. WRA is implementing a phased restoration of four of twelve ponds located on Ridge Top Ranch
Conservation Bank - a 744-acre working cattle ranch. 2010 surveys concluded CRLF to be absent and additional
due-diligence found invasive predators and abiotic impediments to be absent as well. Beginning in October 2010,
two pilot ponds were fenced, planted with select vegetation, and irrigation installed. Two additional ponds were
fenced and seeded in Autumn 2012. In consultation with USFWS, WRA, implemented the first of three years of
translocating egg-masses to the restored ponds. Preliminary data points to early success. Population monitoring
over the next five years, including mark-recapture data, will provide information on demography, dispersal,
colonization, and habitat usage to help recover the species.

**OPTIMIZING GRASSLAND BIRD CONSERVATION AND RANCHING: COMBINING DATA DRIVEN
DECISION-MAKING AND HOLISTIC GRAZING**

Nathaniel Seavy; PRBO Conservation Science; 3820 Cypress Drive, Suite 11, Petaluma, CA, 94954; 415-868-
0655 x311; nseavy@prbo.org; Carlene Henneman and Thomas Gardali

**Grazing, Agriculture and Wildlife Conservation**

In California, and throughout much of North America, declines in grassland bird populations have created
concern about their conservation and management. One conservation opportunity is to identify ways in which
ranching on private lands can protect and enhance grassland bird habitat. Working at a private grass-fed and
finished cattle ranch in coastal California, we were able to identify and test this opportunity. On 68 pastures, we
quantified the density of grassland birds and available cattle forage quality. Assuming that the most cost effective
solution is one that minimizes the area for a given herd size, we compared the percent of bird habitat protected
when pasture selection was based only on forage quality to that protected when both bird density and forage
quality were considered. We found that by incorporating information about bird density, we can increase the
amount of grassland bird habitat dramatically with only a relative modest increase in the number of acres grazed.
Ultimately, for these strategies to be successful in enhancing habitat quality for grasslands birds, reducing
disturbance during the nesting season must be incorporated into holistic grazing plans that explicitly recognize the
importance of multiple-benefit ranching. These results suggest a manner in which ranchers can work with the
conservation community to identify multiple-benefit solutions to one of our conservation challenges.
THE GENETIC SIGNATURE OF A DISEASE OUTBREAK ASSOCIATED WITH POISON EXPOSURE
Laurel Serieys; UCLA, Department of EEB; Hershey Hall, Box 957246, Los Angeles, CA, 91364; 2147292328; laurelserieys@gmail.com; Seth Riley and Robert Wayne

Urban Wildlife, Management and Emerging Issues
Anticoagulant rodenticides are increasingly recognized as a critical issue for wildlife populations. As the number one method of rodent control used worldwide, they are a ubiquitous poison potentially used wherever human activities occur. Although they are readily available for use in urban and agricultural areas, the breadth of the consequences of widespread anticoagulant use on our wildlife remains largely unknown. Given their high trophic level, predatory species are particularly vulnerable to toxins. With this study, we have observed an outbreak of notoedric mange in bobcats, (Lynx rufus), associated with anticoagulant exposure in southern California. Bobcats exposed to anticoagulants are >3.6 times more likely to die of notoedric mange than any other source of mortality. The consequence of this disease outbreak was an abrupt population decline of a southern California bobcat population between 2002-2006. We sampled bobcats before and after the population decline. Our results show a population bottleneck occurred for bobcats in the region, leading to a strong genetic signature of genetic differences within the population before and after the notoedric mange outbreak. These data are critical to advancing our understanding of how these poisons affect wildlife that live in and near urban areas.

SUSTAINING SHALLOW-FLOODED HABITAT IN LATE WINTER USING VARIABLE DRAWDOWN
Kristin Sesser; PRBO Conservation Science; 3820 Cypress Drive, Suite 11, Petaluma, CA, 94954; 707-695-3583; ksesser@prbo.org; Monica Iglecia, Daniel A. Skalos, Khara M. Strum, Matthew E. Reiter, Catherine M. Hickey and Rodd Kelsey

Ecology and Management of Shorebirds
Flooded post-harvest rice-fields in the Sacramento Valley are vital to providing habitat to waterbirds in a region that has lost 90% of its natural wetlands. Creative solutions to rice-field management can create and extend the availability of shallow water habitat for shorebirds. In partnership with California’s rice industry and the Natural Resources Conservation Service we tested a new management practice, “Variable Drawdown” to prolong the availability of shallow water habitat during late winter. Farmers traditionally drain rice fields in early February causing a rapid decline in habitat for the migratory waterbirds present in large numbers through March. In 2012, we worked with 12 rice farmers to delay the drawdown of flooded rice-fields for 1, 2 and 3 weeks beyond the traditional date of February 1. By the end of February, we found significantly higher shorebird densities in the delayed drawdown fields (6.3 shorebirds/ha) than in fields with traditional drawdown timing (0.3 shorebirds/ha), with the highest densities in the most-delayed treatment (8.2 shorebirds/ha), suggesting shorebirds may be concentrating in the last available shallow water. Our results indicate delaying drawdown of rice-fields provides valuable shallow-water habitat and partnerships with rice farmers are essential to affect shorebird habitat conservation in the Sacramento Valley.

HIGH FATALITY AND CARCASS REMOVAL RATES ON A CENTRAL CALIFORNIA ROAD FOR THE CALIFORNIA NEWT (TARICHA TOROSA) AND OTHER AMPHIBIANS.
Robert Shields; H.T.Harvey & Associates; 985 University Ave., Bldg D, Los Gatos, CA, 95032; 4108-710-7827; rshields@harveyecology.com; and Dave S. Johnston

Conservation and Biology of Amphibians and Reptiles
We surveyed a 1.8 k section of road in Central California for California newt (Taricha torosa) fatalities every week for a one-year period. We mapped each carcass and determined the rate of removal for each carcass during the study. Because the road bisects the breeding and upland summer aestivation habitat, we observed relatively
high numbers (398) of fall, winter, and spring migrating adult newts and fall and winter juvenile newts (225) for a total of 623. With some 10-meter sections of road having more than 15 fatalities, the spatial distribution of *Taricha torosa* road kills is uneven, possibly due to landscape features that help dictate migratory pathways. Carcasses of the newts remained longer on the road than other amphibians and reptiles. Our data suggests that some mortality models may underestimate the actual mortality for this species and other amphibians killed on roads.

**AMERICAN KESTRELS: AN OVERVIEW OF A TEN-YEAR NEST BOX PROJECT IN EASTERN MERCED COUNTY**

Steve Simmons; 2499 5th Avenue, Merced, CA, 95340; 209-722-3540; simwoodduk@aol.com; Jim Dunn and Nancy Sage

_Grazing, Agriculture and Wildlife Conservation_

The American Kestrel (*Falco sparverius*) is a small, common falcon for which there is evidence of long-term, gradual but sustained population declines throughout most regions of the US and Canada. We report in detail on a ten-year (2003-2012) nest box and banding project focused on the American Kestrel and carried out on a large cattle ranch in eastern Merced County, California. We describe the riparian and upland grassland habitats on the ranch and the location of boxes within these habitats. We describe the history of our project and the methods and specifics of data collection including the software tools we developed and use. We provide detailed annual statistics showing the overall growth of the kestrel population over the ten-year span of the project. As an example, we show growth in the adult base from 4 kestrels captured in 2003 to over 100 in the most recent year for which we have data, and growth in fledged kestrels from 34 to 289. This last data point from 2012 represents a 22.5% increase over our previous best year. Results from six years of winter trapping kestrels in Merced County with Bal-Chatri traps will also be covered. Using an interface between our software and Google Earth we provide an interesting graphical view of the year-over-year nesting habits of some of the kestrels.

**CREATING INTERTIDAL MARSH IN THE DELTA: OPPORTUNITIES, CONSTRAINTS, AND ADAPTIVE MANAGEMENT**

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_Ecology and Management of Wetlands and Waterbirds_

The Bay Delta Conservation Plan proposes the restoration of 65,000 acres of tidal and adjacent upland habitat to contribute to the conservation and recovery of rare, endemic species—including those that rely almost exclusively upon intertidal habitats such as salt marsh harvest mouse, California clapper rail, and Suisun thistle. Tidal restoration in the Delta is primarily achieved by reestablishing tidal inundation to currently leveed lands. This talk will discuss: the constraints on intertidal restoration such as subsidence, sea-level rise, and sediment accretion rates; passive and active methods that might be employed to address these constraints; and the role of experimental design and adaptive management in reducing future uncertainty. Methods for restoring intertidal elevations vary substantially in cost, with the highest costs being associated with habitat-related objectives that must be met within short timeframes. Restoration planning will need to carefully weigh long-term biological objectives against cost as intertidal environments are expected to change in response to climate shifts.
HIGH TIDE AVOIDANCE AND MOVEMENT OF THE ENDANGERED SALT MARSH HARVEST MOUSE

Katherine Smith; California Department of Fish and Game; 4001 N Wilson Way, Stockton, CA, 95205; (530) 400-7729; krsmith@dfg.ca.gov; Laureen M. Barthman-Thompson, William R. Gould and Karen E. Mabry

Biology and Ecology of Small Mammals
Understanding how behavioral plasticity helps animals cope with human-induced environmental heterogeneity is crucial because organisms are under increasing pressure from habitat urbanization and degradation. Species that evolved in naturally variable environments may be more able to respond flexibly to human-induced change. The salt marsh harvest mouse (Reithrodontomys raviventris) is an endangered species that evolved in tidal marshes and is also found in human-created diked habitats. Our objectives were to identify the primary type of refuge used by this species during inundation of its habitat by sea water at high tide (i.e., emergent vegetation or areas of higher elevation), and to compare movement rates of salt marsh harvest mice living in tidal and diked wetlands. We used radio telemetry to observe mice in tidal and diked wetlands during high tides associated with the full and new moons. Results indicate that, mice predominantly remain in emergent vegetation above water during high tides. Nocturnal movement rates did not differ between diked and tidal wetlands. However, differences between nocturnal and diurnal movement rates within wetland types suggest that mice living in diked areas may have modified their behavior to take advantage of the lack of tidal inundation by sleeping through the day.

TRANSITIONAL HABITAT: THE VALUE OF BREACHED FORMER SALT PONDS FOR MIGRATORY WATERBIRDS

Lacy Smith; US Geological Survey; 505 Azuar Dr., Vallejo, CA, 94592; 707-310-2229; lmsmith@usgs.gov; John Y. Takekawa, Stacy Moskal, Tanya Graham, Eric Mruz, Cheryl Strong and Karen Taylor

Ecology and Management of Wetlands and Waterbirds
The U.S. Fish and Wildlife Service and the California Department of Fish and Game purchased former salt production ponds around San Francisco Bay in an effort to restore tidal salt marsh habitats and maintain migratory waterbird areas. As part of restoration monitoring efforts, the USGS has collected data on waterbird abundance and distribution within these ponds for over the last 10 years. To date, tidal flow has been restored to over 2,000 ha of ponds in the north and south San Francisco Bay. This transitional habitat provides important areas for migratory waterbirds in the early phases of marsh restoration, but will eventually disappear as marsh vegetation establishes over time. The introduction of tidal flow back into these ponds has created new foraging habitat for shorebirds at low tide and waterfowl habitat at high tide. We found that prior to breaching, ponds were unoccupied by shorebirds at low tide and supported over 21,000 shorebirds and ducks at high tide. Post restoration of tidal flow, high tide water levels within the ponds forced roosting shorebirds to move other areas while maintaining large duck populations. At low tide, over 26,000 shorebirds and dabbling ducks foraged across the pond bottom mud flats.

ROAD AVOIDANCE AND WILDLIFE-VEHICLE COLLISION RISK ALONG STATE ROUTE 101 BETWEEN ATASCADERO AND SAN LUIS OBISPO, CA

Sara Snyder; H.T. Harvey & Associates; 4251 South Higuera Street, San Luis Obispo, CA, 93401; 805-754-8244; ssnyder@harveyecology.com; John Perrine and Andrew Schaffner

Ecology and Management of Large Mammals and Carnivores
High traffic volume can cause animals to avoid crossing and using the habitat around roadways. This avoidance behavior can result in genetically isolated subpopulations which may experience genetic drift and increased
potential for extinction. The negative effects of traffic volume have been studied in large carnivore and ungulate species but few studies have focused on smaller ungulates and mesocarnivores. We used camera traps to document the activity patterns of mule deer and mesocarnivores around State Route 101 between Atascadero and San Luis Obispo, CA and obtained hourly traffic volumes from the California Department of Transportation. With this information we determined if traffic volume was causing road avoidance behaviors in deer or mesocarnivores and when the risk of deer-vehicle collisions (DVC) and mesocarnivore-vehicle collisions (MVC) were highest. We found that mesocarnivores were less likely to be present when traffic volume was high, while deer activity was unrelated to traffic. We also found that DVC risk was highest during morning and afternoon peaks in traffic volume and MVC risk was highest during the morning peak and after the evening peak. These results indicate that SR 101 requires mitigation to restore habitat permeability for mesocarnivores and to protect motorists from DVCs and MVCs.

**LANDSCAPE AND ROADWAY CHARACTERISTICS ASSOCIATED WITH WILDLIFE-VEHICLE COLLISION HOTSPOTS ALONG STATE ROUTE 101 BETWEEN ATASCADERO AND SAN LUIS OBIPO, CA**

Sara Snyder; H.T. Harvey & Associates; 4251 South Higuera Street, San Luis Obispo, CA, 93401; 805-754-8244; ssnyder@harveyecology.com; John Perrine and Andrew Schaffner

**Ecology and Management of Large Mammals and Carnivores**

Wildlife-vehicle collisions (WVCs) are on the rise. In the US WVCs result in the death of approximately 365 million animals and 290 humans and cost an estimated $8.388 billion per year. WVCs spatially cluster and are associated with certain landscape and roadway characteristics. Previous research into WVCs has focused predominately on ungulates, while few studies have focused on several taxa along the same road. Between May 2009 and June 2010 we documented WVCs locations along State Route 101 between Atascadero and San Luis Obispo using vehicle-based roadkill surveys. This section of SR 101 bisects a large mammal movement corridor and an ecologically important connectivity corridor between the Santa Lucia Mountains in Big Sur and the Sierra Madres Mountains to the south, bringing motorists and large mammals into conflict and potentially fragmenting wildlife populations. We determined WVC hotspot locations and associated landscape and roadway characteristics for large mammals, mesocarnivores, and small mammals. Black bear and mesocarnivore roadkill hotspots were centered where the large mammal and connectivity corridor bisected the roadway. Similar to other studies, large mammal and mesocarnivore roadkills occurred near riparian areas. Small mammal roadkills were more likely to occur where the road was divided by a large grassy median.

**REPRODUCTIVE SUCCESS OF DICKCISSELS BREEDING IN MANAGED PRAIRIE**

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**Conservation and Management of Songbirds**

Grassland birds are declining more rapidly than any other group of North American birds. While the effects of habitat destruction on avian populations are well known, the effects of habitat management are less clear. Furthermore, a population’s response to habitat management may vary with climatic conditions. I investigated the effects of spring rainfall and managed burning on the reproductive success and phenology of an obligate grassland breeding bird, the dickcissel. Nest survival did not differ amongst burn regimes, but did vary among years. Timing of breeding varied significantly, with nesting occurring earlier in frequently burned sites, and ending later in unburned sites and in years with high rainfall. Finally, clutch size and the number of dickcissels fledged per successful nest were significantly higher in frequently burned plots. In the case of the dickcissel, increased management of prairie habitat has a positive effect on the number of young produced per nest. Additionally, higher rainfall promoted greater success and a longer breeding season. The results of this study suggest that
reliance on estimates of nest survival alone may not fully represent the effects of management on breeding success in this species. Further, the effects of management may vary depending on climatic conditions.

**HABITAT USE AND HOME RANGE ESTIMATES FOR TULE ELK IN EASTERN SAN LUIS OBISPO COUNTY**

Robert Stafford; California Dept. of Fish and Game; P.O. Box 6360, Los Osos, CA, 93412; 805-528-8670; bstafford@dfg.ca.gov; and Joe H. Hobbs

*Ecology and Management of Large Mammals and Carnivores*

After nearly going extinct, tule elk (*Cervus elaphus nannodes*) were reintroduced into previously occupied range and now over 4,000 tule elk can be found in California. Concurrent with these releases has been the desire to manage habitat for this species. To better understand the amount of area and habitat types used by elk, we placed GPS radio collars on 14 female and 4 male tule elk in eastern San Luis Obispo County. Home ranges ranged from 3,600 to 12,600 ha (x=8,441 ha) for cow elk. Bull elk home ranges were significantly larger (p=0.026) and ranged from 8,300 to 31,400 ha (x=20,915). There was no movement of female elk between subherds even though the subherds were only a few miles apart. However, males did move between subherds, particularly during the rut. Elk primarily used grasslands with lesser use of coastal scrub, desert scrub and juniper woodland. Chaparral communities and oak woodlands were avoided. Preliminary analyses suggest that elk selected grasslands that had not been grazed by cattle within the previous three years. Future work will entail analyses of habitat use patterns utilizing more refined vegetation data.

**WESTERN YELLOW-BILLED CUCKOO RESPONSE TO LOWER COLORADO RIVER HABITAT RESTORATION**

John Stanek; Southern Sierra Research Station; P.O. Box 1316, Weldon, CA, 93283; (760) 378-3345; jrstanek.ssrs@gmail.com; Shannon E. McNeil, Diane T. Tracy and Jenna E. Stanek

*Conservation and Management of Songbirds*

The western yellow-billed cuckoo (*Coccyzus americanus occidentalis*) has been extirpated from most of its former range. However, along the lower Colorado River (LCR) the Bureau of Reclamation Lower Colorado River Multi-Species Conservation Program (MSCP) has been planting restoration habitat for the cuckoo and other declining species to stem declining population trends. Here we present a summary of five years of LCR cuckoo research (occupancy surveys, breeding territory trends, nest success and habitat use) with a focus on how cuckoos have responded to MSCP habitat restoration. Overall, restoration habitat efforts have been successful, with cuckoo occupancy, territory density and nest density at MSCP restoration habitat now exceeding that found at natural non-restoration habitat.

**NEST SITE SELECTION OF WESTERN YELLOW-BILLED CUCKOOS ALONG THE LOWER COLORADO RIVER**

Jenna Stanek; Southern Sierra Research Station; P.O. Box 1316, Weldon, CA, 93283; 760-378-3345; jestanek.ssrs@gmail.com; Shannon E. McNeil, Diane T. Tracy and John R. Stanek

*Conservation and Management of Songbirds*

The Western Yellow-billed Cuckoo (*Coccyzus americanus occidentalis*), formally found throughout the western United States, has experienced wide-spread loss of their preferred riparian cottonwood/willow habitat, which has resulted in its extirpation from most of its historic range. In order to effectively facilitate conservation of this species, it is essential to recognize the important attributes of suitable breeding habitat. We analyzed data
collected from 2006-2012 in the Lower Colorado River (LCR) region to assess the influence of habitat characteristics on nest site selection. We used mixed model multiple logistic regression and multi-model inference based on Akaike’s Information Criterion to compare the habitat characteristics found at Western Yellow-billed Cuckoo nest sites and available habitat. Overall, the results show that Western Yellow-billed Cuckoos are selecting nest locations based on high densities of native small trees, increased canopy cover, and lower diurnal temperatures. Nest site selection also may be negatively influenced by tamarisk density and positively by native large tree density. Within the LCR region, we recommend that conservationists and land managers work to encourage native tree communities and areas with high levels of canopy cover in order to maintain critical nesting habitat for the Western Yellow-billed Cuckoo.

GLOBAL PHYLOGEOGRAPHY OF THE MOST WIDELY DISTRIBUTED CARNIVORE, THE RED FOX (VULPES VULPES)

Mark Statham; UC Davis; One Shields Avenue, Davis, CA, 95616; 530-754-7932; statham@ucdavis.edu; James Murdoch, Jan Janecka, Ceiridwen Edwards and Ben Sacks

Ecology and Management of Large Mammals and Carnivores

Widespread species may look superficially similar throughout their range yet encompass unrecognized divergent lineages. Such divergent lineages are often geographically restricted and attributable to past climatic events. The red fox (Vulpes vulpes) is the most widely distributed carnivore in the world, with a native range extending around the Northern Hemisphere from Europe through to North America. The species inhabits a wide variety of different habitats from temperate deserts though to Arctic tundra, and also runs the gamut of conservation concern from regionally extinct to invasive nonnative. With these factors in mind, we conducted a range wide phylogeographic study of the red fox, analyzing over 1000 specimens and using both mitochondrial and nuclear DNA markers. We identified multiple divergent lineages, and molecular dating methods indicated long term subdivision between animals from different geographic areas. Such endemic divergent lineages likely represent separate evolutionary significant units.

THE SCIENCE AND POLITICS OF RECOVERY: CONSERVING ENDANGERED SIERRA NEVADA BIGHORN SHEEP

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Endangered Species Act Implementation: Successes and Challenges

The historical range for Sierra Nevada bighorn sheep includes much of the central and southern Sierra Nevada. The vast majority of the recovery area is federally protected Wilderness and habitat is generally not limiting. A detailed analysis of the demography and behavior of these federally endangered bighorn sheep reveals that vital rates often vary by subpopulation. Consequently, conservation strategies are adjusted across the range to address threats that vary in time and space. We continue to modify our approach to recovery as we gather new details about the life history of this species that occupies such wide-ranging and challenging terrain. Extensive sampling of population parameters, nutritional status, and resource selection has broadened our understanding of the factors that affect recovery. Having the best science possible is essential for reaching recovery goals and in addressing the politics of recovery. Nevertheless, recovery actions such as modifying domestic sheep grazing on public land, implementing prescribed fire, managing predators, and using helicopters in wilderness have proven to be controversial. Conflicts have arisen as a result of disagreements about land use practices both within and adjacent to the recovery area and debate about the urgency with which recovery should occur.
PIKAS AND CLIMATE: PATTERNS OF APPARENT EXTINGUISHMENT IN CALIFORNIA

Joseph A. E. Stewart; University of Nevada; 1664 N Virginia St, MS 314, Reno, CA, 89557; 302-299-2758; joaelst@gmail.com; John D. Perrine and David H. Wright

**Climate Change and Wildlife: Managing Moving Targets**

We analyze results from 59 resurveys of historic pika locations in California by 5 separate research teams. Sites were located from historic field notes, museum specimens, or correspondence, and were surveyed to determine if currently occupied by pikas. To confirm extirpation, all talus habitat within a 1 km radius was searched. Overall, 49 sites were determined to be currently occupied by pikas, while 10 sites appeared to be extirpated. Half (n=5) of apparently extirpated sites were located in the Lassen region. Apparent extirpations were also observed in the Sierra Nevada (n=2) and the Bodie Hills (n=3). Across all sites, low talus habitat abundance was the best predictor of site extirpation. Climate variables were also statistically significant predictors of extirpation in both univariate and multivariate analysis, with warmer, drier, and lower-elevation sites more likely to be extirpated. In the absence of statically rigorous historic wildlife inventories, resurveying historic record locations may be the best tool we have for inferring changes in occupancy patterns over time. However, because most historic records are presence only, and because historic surveys did not attempt to randomly sample the landscape, caution must be exercised in interpreting resurvey results.

THE IMPACT OF LARGE HIGHWAYS ON MAMMALIAN COMMUNITY COMPOSITION IN SOUTHERN CALIFORNIA’S CONSERVED LANDS

Kelcey Stricker; ESA; 9191 Towne Centre Drive, San Diego, CA, 92122; 619-952-7706; kelcey.ann.stricker@gmail.com; William Kristan, Tracey Brown and Thomas Spady

**Ecology and Management of Large Mammals and Carnivores**

In 2000, the South Coast Wildlands Missing Linkages Project identified the conserved lands that link the inland Palomar Mountains to the coastal Santa Ana Mountains as the last inland to coastal wildlife linkage in southern California. This linkage is thought to be essential for regional migration of carnivores and large mammals within the Santa Ana Mountains, including mountain lion, bobcat, and gray fox. However, this linkage is currently impacted by one of the largest and busiest freeways in the US, Interstate 15, which runs through the most constrained portion of it. Video cameras were placed along the roads edge and within conserved lands to determine the potential direct and indirect impacts of I-15 on the mammalian community composition. Initial results indicate that community composition within conserved lands is significantly different than community composition near the road. This suggests the I-15 is having an impact on the movement of the mammalian community within the linkage that extends beyond its physical footprint. This research is currently ongoing. The ultimate goal is to provide guidance on enhancing wildlife linkages that are impacted by busy roads and other urban uses in southern California.

CREATION AND MANAGEMENT OF ISLANDS FOR ROOSTING AND FORAGING WATERBIRDS

Cheryl Strong; USFWS; 1 Marshlands Road, Fremont, CA, 94555; 510-557-1271; cheryl_strong@fws.gov; and Laura Valoppi (presenting)

Protected and isolated islands are prime property in the urban landscape of the south San Francisco Bay and provide important roosting and nesting habitat for waterbirds. Through an adaptive management approach, the South Bay Salt Pond Restoration Project has been experimenting with island creation and management in former salt evaporator ponds. Islands made from existing bay mud materials require a few years of weathering before they can be safely used by nesting birds; this process may be accelerated through soil amendments or discing. The cost of this type of amendment should be factored into the original construction cost of the islands. Also,
placement of islands in the landscape needs to take into account the foraging needs of both adult and young of
the species. And finally, roosting birds may have different needs than nesting, and there may not be a “one size
fits all” island that we can build that would make everyone happy.

THE CONSERVATION BANKING TOOL: ROLE AND REQUIREMENTS

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The Endangered Species Act, Conservation Banking and Related Tools
for Mitigating Impacts to Wildlife

Conservation Banking is a tool that provides a high level of protection in perpetuity. The tool has been refined and
perfected through two decades of implementation and offers reliable landscape-level enhancement and protection
for species and ecosystems. This presentation will compare and contrast Conservation Banking to other mitigation
and conservation tools and explore when each tool is the best fit for various ecological objectives. The
compatibility of Conservation Banking with habitat conservation plans will also be addressed.

GENETIC STRUCTURE AND GENETIC DIVERSITY OF
GREATER SAGE-GROUSE IN MONO COUNTY, CALIFORNIA

Joel Tebbenkamp; University of Idaho; Moscow, ID; tebb0730@vandals.uidaho.edu; Scott Gardner
(presenting), Kerry P. Reese and Lisette P. Waits

Upland Habitats, Game Birds and Wildlife

The Bi-State population of greater sage-grouse (Centrocercus urophasianus) is a Distinct Population Segment
(DPS) and candidate for listing under the Endangered Species Act. The status of the Bi-State DPS is based largely
on its genetic and geographic isolation from other greater sage-grouse populations. Within the Bi-State
population, there are multiple localized populations that appear to be demographically independent, yet limited
fine-scale genetic data are available to address potential genetic differences. To help facilitate a more
comprehensive understanding of the dynamics within the Bi-State population our objectives were to identify
genetically distinct populations, assess genetic diversity, and identify first-generation dispersers using molecular
techniques. Through capture and noninvasive genetic sample collection during 2007-2011 we sampled 331 sage-
grouse throughout Mono County, CA, characterizing each individual at 17 nuclear microsatellite loci. Pairwise
FST between localized populations ranged from 0.065-0.246. Combining the results of the pairwise FST estimates
and 2 Bayesian clustering analyses, we identified 5 genetic populations; however, genetic diversity indices
(He=0.58-0.60, AR= 2.86-3.19) were not significantly different between populations. We also identified 9 first-
generation dispersers.

THE ROLE OF WILD RODENTS IN THE MAINTENANCE OF ENDEMIC TICK-BORNE
RELAPSING FEVER (Borrelia hermsii) IN THE SIERRA NEVADA MOUNTAINS

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Biology and Ecology of Small Mammals

Endemic relapsing fever in the western United States is caused by Borrelia hermsii and transmitted by the soft-
tick Ornithodoros hermsi. The disease can lead to significant illness in humans that become infected following the
bite of a tick. Wild rodents are thought to be the reservoir for the pathogen although little is known as to which
wild rodent species can become infected. We trapped wild rodent reservoir hosts from sites where human
infection has historically or recently occurred. Fifty traps were set next to homes while another fifty were placed in adjacent sylvatic habitats. All animals were bled via retro-orbital abrasion, keyed out to species, and marked with an individually identifying ear tag. DNA from blood was extracted and then assayed for *B. hermsii* infection using qPCR. The bacteria in all positive individuals were sequenced to confirm pathogen species and strain genotype. In the summer months of 2009-2011, 916 wild rodents from five endemic sites in the Sierra Nevada and San Bernardino mountains were tested for *B. hermsii* using qPCR. Prevalence varied between 2.3% and 12.3% at each location and chipmunks (*Tamias* spp.) were PCR-positive at every location. Additionally, deer mice, golden-mantled ground squirrels, and a woodrat were also infected. Although reservoir competence experiments have not been conducted, the widespread distribution and infection in chipmunks suggests the potential to maintain *B. hermsii* in nature. In areas where there were homes we trapped significantly more rodents and consequently more infected animals as compared to our study sites with little to no human habitation or use. Additionally, we sequenced the rDNA intergenic spacer (IGS) region from 34 positive samples, which included representative DNA from each location and from chipmunks, deer mice, and golden-mantled ground squirrels.

### BALANCING WATERBIRD PROTECTION AND PUBLIC ACCESS

**Lynne Trulio**, San Jose State University; One Washington Square, San Jose, CA, 95192-0115; 408-924-5445; Lynne.Trulio@sjsu.edu; Jana Sokale, Heather R. White and Kevin D. Lafferty

*Ecology and Management of Wetlands and Waterbirds*

Wetlands and coastal areas provide roosting and foraging sites for large populations of wintering waterbirds. But, wetlands can also be attractive recreational areas for the public, especially in highly urbanized areas. Wildlife managers must often balance the potentially-competing goals of protecting wildlife while providing public access. In the urban South San Francisco Bay area, we used an experimental approach-exposing birds to one or two walkers on levees adjacent to wetlands used by foraging birds-to study the effect of trail use on wintering shorebirds and waterfowl in foraging areas. We found bird responses were both species and situation dependent. At sites without existing trails, shorebirds exposed to experimental walkers showed short-term behavioral responses, but numbers and behaviors immediately after our walks did not differ from before the walk. During walks, shorebirds were approximately 25-30m from the walkers. However, waterfowl numbers were much lower after our experimental walks compared to before the walk, at distances of 100m or more from the levee. Also, waterfowl did not appear to be habituating to regular trail use at sites with existing trails. We offer recommendations for protecting waterbirds from trail use disturbances while allowing people to enjoy the beauty of the wetlands.

### HABITAT ASSOCIATIONS OF A SACRAMENTO-SAN JOAQUIN DELTA POPULATION OF CALIFORNIA BLACK RAIL (\textit{LATERALLUS JAMAICENSIS COTURNICULUS})

**Danika Tsao**, California Department of Water Resources; 3500 Industrial Boulevard, West Sacramento, CA, 95691; 916-376-9783; dtsao@water.ca.gov; and Ronald E. Melcer, Jr.

*Ecology and Management of Wetlands and Waterbirds*

Historic survey work aimed at documenting the distribution and status of state threatened California Black Rail (*Laterallus jamaicensis coturniculus*) has largely overlooked the Sacramento - San Joaquin Delta. During March, April, and May of 2010-11, we collected information on species presence using playback surveys within wetland habitats of the central Delta region. We detected California Black Rails throughout the interior Delta, primarily on in-stream islands with dense vegetative cover. We used a maximum entropy modeling approach to analyze the vegetation types associated with rail presence, and assessed patch size at sites where rails were detected. Model predictive power (mean test AUC) was 0.974. Areas outside of tidal influence showed low suitability, while wetland, riparian and, agricultural land cover contributed the greatest to model AUC. The probability of presence...
was most strongly and positively influenced by red-stem dogwood (*Cornus sericea*), arroyo willow (*Salix lasiolepis*), bulrush (*Schoenoplectus spp.*), and, broad-leaf cattail (*Typha latifolia*). We also found differences in mean site size; sites where rails were detected were significantly larger (14.46 ha, *SE* = 2.40) than locations where no rails were found (6.85 ha *SE* = 0.94). These habitats differ from those used in San Francisco Bay, where Black Rails are found in high tidal marshes dominated by pickleweed (*Sarcocornia pacifica*), and from foothill Black Rails, who use emergent wetland vegetation associated with irrigated lands. Further study of habitat structure and elevation of Black Rail habitat in the Delta is needed in order to assess the impacts of climate change, flood control activities, and water development actions within the region.

### BIRDS AND WORKING WATERWAYS OF CALIFORNIA’S CENTRAL VALLEY: AVIAN USE OF NATIVE HEDGEROWS COMPARED TO UNMANAGED FIELD MARGINS

**Karen Velas**; Audubon California; P.O. Box 733, Winters, CA, 95694; 530-795-0660; kvelas@audubon.org; Rachael F. Long, William L. Rockey, Hillary M. White and Rodd Kelsey

**Grazing, Agriculture and Wildlife Conservation**

In the Central Valley of California over 98% of native riparian habitat has been lost or degraded over the last 150 years, largely due to agricultural expansion. This loss translates to a loss of key habitat for overwintering, migratory, and breeding birds. Native hedgerows planted along waterways, irrigation ditches and farm-edges may provide a small but essential strip of habitat for these birds. Planting hedgerows at field margins is an increasingly common conservation measure in heavily transformed agricultural regions of California, but effects of hedgerows on avian abundance and diversity in the Central Valley remain poorly described. In collaboration with UC Cooperative Extension and UC Davis, we conducted a preliminary study in Winter 2011-Spring 2012 to determine use of 8 sites (4 hedgerows and 4 unmanaged field margins paired by location and field crop) by birds wintering and breeding in Yolo County. We compared avian abundance and diversity at hedgerows versus unenhanced field margins. Initial analyses indicate that more than twice as many bird species and nearly four times as many individuals use habitat created by native-planted hedgerows compared to unmanaged control sites. These preliminary results, encouragingly, indicate that hedgerows may provide important bird habitat within the Central Valley landscape.

### TICKS AND SPOTTED FEVER GROUP RICKETTSIAE ASSOCIATED WITH FISHERS (MARTES PENNANTI) AND RINGTAILS (BASSARISCUS ASTUTUS) AT THE HOOPA VALLEY INDIAN RESERVATION

**Elliot Ven Rooy**; Humboldt State University; 1 Harpst St, Arcata, CA, 95521; 707-497-8636; elvenrooy@gmail.com; Mourad W. Gabriel, Kerry Rennie, J. Mark Higley and Richard N. Brown Student Paper

**Wildlife Diseases and Pathology**

Fishers (*Martes pennanti*) and ringtails (*Bassariscus astutus*) are both species of conservation concern in California. Disease risks for fishers have been evaluated, but this is the first report of pathogens associated with ticks removed from either of these carnivore species. 1040 adult and nymphal ticks removed from fishers and ringtails trapped at the Hoopa Valley Indian Reservation. Of these, 933 ticks were able to be identified to species and another 107 were only able to be identified to genus. A subset of 316 ticks were selected using stratified sampling, and processed using DNA extraction, polymerase chain reaction (PCR) methods, and sequencing techniques to assay for spotted fever group (SFG) *Rickettsia* spp. The prevalence of SFG *Rickettsia* in ticks from fishers was 98% (97/99) in *Ixodes pacificus*, 16.7% (26/156) in *Ixodes rugosus*, and 24.2% (8/33) in *Dermacentor variabilis*. In ticks from ringtails, SFG *Rickettsia* prevalence was 100% (3/3) in *I. pacificus*, 55.1% (13/22) in *I. rugosus*, and 33.3% (1/3) in *D. variabilis*. The identification of tick species and their *Rickettsia* pathogens
provide an initial assessment of possible tick-borne disease risks for these carnivore species and have established a baseline of knowledge for further studies.

**DEER MANAGEMENT RESEARCH USING THE INTERNET: ANALYSIS OF DEER-VEHICLE COLLISIONS AND A SURVEY OF CURRENT DEER MANAGEMENT ISSUES**

**Kent Webb**; San Jose State University; 129 South 10th Street, San Jose, CA, 95192-0244; 408-924-1348; g.webb@sjsu.edu

*Ecology and Management of Large Mammals and Carnivores*

As an experiment in using social media for a data source, postings on photo sharing sites were used to populate a simple, geographical model that reliably predicted the location of freeway deer-vehicle collisions in the San Francisco Bay area as reported to the California Roadkill Observation system by citizen scientists. Overlaying these two independently collected data sets corroborated the information value for each of the data sources. Further analysis aided by tools in Google Maps supported other research findings with regard to the importance of road conditions and design in determining the likelihood of a collision. In another internet application, a semi-automated, daily internet search conducted over the past year was used to identify major trends in deer populations and management, these include: the drought induced, widespread outbreak of Epizootic Hemorrhagic Disease (EHD) that is consistent with global warming; the progression of Chronic Wasting Disease (CWD) and the promise of a significant management innovation; the independent review of Wisconsin’s deer management program that criticized current population models and inadequate public input; the decline of California’s deer population and trends in other deer populations.

**NEST SURVIVAL OF TRICOLORED BLACKBIRDS IN CALIFORNIA’S SAN JOAQUIN VALLEY**

**Kelly Weintraub**; Humboldt State University; P.O. Box 853, Arcata, CA, 95518; (530) 228-8411; kaw167@humboldt.edu; and T. Luke George

*Conservation and Management of Songbirds*

The colonially-nesting Tricolored Blackbird (*Agelaius tricolor*) is a Species of Special Concern due to population declines caused by the loss of wetland nesting habitat. Over the past few decades an increasing proportion of the population has nested in agricultural fields, prompting the U.S. Fish and Wildlife Service to pay farmers to delay harvesting in attempt to increase nesting productivity. If nest survival is higher in wetlands than in agricultural fields, investment might be better spent on wetland creation or enhancement. Our objectives were to estimate the daily survival rate (DSR) of nests in wetland and agricultural habitats and to identify habitat covariates that influence DSR. In 2011 - 2012 we monitored 1,252 Tricolored Blackbird nests in 14 colonies using small temperature data loggers. We modeled DSR of nests using RMark with nesting site, habitat type, nest initiation date, nest height, water depth, nest density, and population size as covariates. DSR was positively associated with nest height and nest density and negatively associated with population size. DSR decreased and then increased as the season progressed. Nest survival varied greatly from site-to-site but was not explained by habitat type. A post hoc analysis indicated that the presence of White-faced Ibis (*Plegadis chihi*) significantly lowered DSR.
HABITAT-MEDIATED PREDATION RISK TO FISHERS BY BOBCATS IN A MIXED CONIFEROUS FOREST

Greta Wengert; University of California, Davis; One Shields Ave, Davis, CA, 95616; 707-845-7848; gmwengert@ucdavis.edu; J. Mark Higley, Sean M. Matthews, Kerry M. Rennie, Shannon M. Mendia and Benjamin N. Sacks

Ecology and Management of Large Mammals and Carnivores
Predation is the most frequent cause of mortality for fisher, a rare forest carnivore and candidate for listing under the Endangered Species Act. Bobcats are the most common predator of fisher in most regions of the fisher range in California and can account for up to 36% of all mortality in some fisher populations. We captured bobcats in 2009 - 2012 at the Hoopa Fisher Project on the Hoopa Valley Indian Reservation where fishers were simultaneously being monitored and equipped them with GPS collars to track their movements and habitat use in relation to fisher. Interspecific spatial overlap between neighboring individuals of different species was assessed through the percentage of home range that overlaps with an interspecific neighbor. To characterize the habitat types that have the most risk of interaction between the species, resource selection functions were used. In this analysis “used” sites were those fisher locations at which a bobcat location occurred within 100m to represent areas that bobcats and fishers both use. This information will be used to develop a model of “risky” habitat for fishers.

GENETIC ANALYSIS OF MULTIPLE ENDANGERED SPECIES SUPPORTS THE CORE POPULATION MODEL IN SAN JOAQUIN VALLEY UPLAND SPECIES RECOVERY PLAN

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The Endangered Species Act, Conservation Banking and Related Tools for Mitigating Impacts to Wildlife
The Recovery Plan for Upland Species of the San Joaquin Valley, California, published by the U.S. Fish and Wildlife Service in 1998, provides a roadmap to recovering a number of endangered species including the San Joaquin kit fox (Vulpes macrotis mutica), the blunt-nosed leopard lizard (Gambelia sila) and the giant kangaroo rat (Dipodomys ingens). A conceptual element common to the conservation strategies in the Plan revolves around the erection of core population areas within which certain targets for conservation are established. The core population areas were identified on the basis of geographic disjunction and occupancy. With the advent of genetic techniques it is now possible to ask whether independent criteria of population subdivision and genetic distinctiveness support the core population concept. Within-species phylogenys based on mtDNA as well as micro satellite-based measures of genetic isalations show close concordance among all three species named above, and suggest the existence of three major population centers: the Ciervo-Panoche region, the Carrizo Plain region, and the southern San Joaquin Valley floor. These independently-derived populations are highly concordant with the core areas proposed in the Recovery Plan and suggest that the core population model continues to hold merit as a strategy for recovery.
Abstracts for Oral Presentations Sorted Alphabetically by Author

**A LONG-TERM STUDY OF A SOUTHWESTERN WILLOW FLYCATCHER POPULATION: WHAT HAVE WE LEARNED?**

Mary Whitfield; Southern Sierra Research Station; P.O. Box 1316, Weldon, CA, 93283; (760) 378-3345; mjwhitfield.ssrs@gmail.com

**Conservation and Management of Songbirds**

The Southwestern Willow Flycatcher (*Empidonax traillii extimus*) was listed as an endangered species in 1995. The listing prompted a plethora of research, including several long-term studies (i.e. ≥10 years) at various sites. One of these studies was located in the Kern River Valley in California. In 1989, I initiated a study to investigate the factors that affect the reproductive success and population size of Southwestern Willow Flycatchers on the South Fork Kern River. Initially the main focus of the research was investigating the effects of cowbird parasitism on the population. It has since expanded into examining other aspects of flycatcher biology such as habitat selection, food availability, reproductive success and survivorship estimates. Unfortunately, despite an ongoing cowbird trapping program, the population has declined from a high of at least 75 individuals in 1997 to a low of 11 individuals in 2012. Although cowbird parasitism was negatively affecting the flycatcher’s reproductive success in the past, factors other than cowbirds are presently limiting the Kern Willow Flycatcher population. In this talk, I briefly summarize my research on habitat selection, food availability, reproductive success and survivorship to help examine what factors might have led to the decline of this flycatcher population.

**PROTECTING SPECIES THREATENED BY CLIMATE CHANGE UNDER THE U.S. ENDANGERED SPECIES ACT: OPPORTUNITIES AND CHALLENGES**

Shaye Wolf; Center for Biological Diversity; 311 California Street, Suite 600, San Francisco, CA, 94101; 415-385-5746; swolf@biologicaldiversity.org

**Endangered Species Act Implementation: Successes and Challenges**

Climate change will increase extinction risk for many species, underscoring the need for effective mitigation (greenhouse gas reduction) and adaptation (resilience-increasing) measures to reduce this risk. The U.S. Endangered Species Act has the ability to provide climate change mitigation and adaptation benefits to listed species, particularly through its requirements for designating critical habitat and developing recovery plans. We examined the extent to which the ESA has been applied to list species based on climate change threats, and the extent to which critical habitat designations and recovery plans address climate change, through June 2012. Six percent of species listings identify climate change as a threat, although only one species, the polar bear, has been listed principally due to climate change threats. Recovery plans for 17% of species with plans address climate change, 14% identify climate change as a threat, and 10% suggest recovery actions to reduce climate impacts. Critical habitat designations for 22% of species with designations address climate change, 20% identify climate change as a threat, and 2% factor climate change into habitat protection. Although incorporation of climate change into ESA protections is increasing over time, we explore barriers and underutilized opportunities in applying the ESA to benefit climate-threatened species.
MOLECULAR ANALYSIS OF CHANGES IN POPULATION SIZE OF AMERICAN KESTRELS IN NORTHERN AND CENTRAL CALIFORNIA

Elizabeth Wommack; University of California Berkeley; Museum of Vertebrate Zoology, 3101 VLSB, UC Berkeley, Berkeley, CA, 94720; 707-337-9555; ewommack@berkeley.edu; and Rauri C. K. Bowie

Ecology and Management of Raptors
The American Kestrel (*Falco sparverius*) has often been counted as one of North America’s most common species of raptor. However, recent demographic data from both migration and nesting sites, especially in the northeast of the continent, have begun to reveal a decrease in the number of individuals, sparking a concern that the North American subspecies (*F. s. sparverius*) may be beginning to decline. Count data from the Breeding Bird Survey and the Christmas Bird Counts collected in California and neighboring western states suggests that there is a similar, but less severe, decline for the subspecies in the west of the continent. Yet migration and nest box counts in California have not shown a similar decreasing trend. One important source of information that has not yet been utilized in this analysis is genetic data. Examination of changes in genetic diversity can help provide information on long-term changes in population size. In this study we used microsatellite markers to collect information from breeding adults in both northern and central California trapped in 2008-2012, to look at genetic evidence of changes in the size of the California population of American Kestrels.

WILD BIRDS AND WEST NILE VIRUS

Stan Wright; Sac-Yolo MVCD; 8631 Bond Road, Elk Grove, CA, 95624; 916-405-2068; swright@sac-yolomvcd.com; Beatrix Treiterer, Paula Macedo, Bart McDermott and Dave Brown

Wildlife Diseases and Pathology
Our presentation uses long-term, constant-effort mist net data to examine the impact on wild birds from the invasion and establishment of West Nile Virus on the Stone Lakes National Wildlife Refuge. We focus on changes in wild bird capture rate, productivity, age ratio and serology to interpret the impact. We provide an overall picture of avian seroprevalence since the arrival of WNV in 2004 to the present. Wild bird results are then coupled with *Culex* mosquito infection prevalence during the same time period to give a virus transmission profile. Finally we focus on site locations to examine WNV clumping, herd immunity and recrudescence.

THE EMERGING WILDLIFE PROFESSIONAL: THE NEXT GENERATION OF WILDLIFE PROFESSIONALS, CORE COMPETENCIES, AND THE CHANGING ROLES OF COLLEGES AND UNIVERSITIES

David Wyatt; Sacramento City College - Biology Dept; 3835 Freeport Blvd, Sacramento, CA, 95822-1386; 916-558-2406; wyattd@scc.losrios.edu; Kathleen M. Norton and Daniel P. Neal

Urban Wildlife, Management and Emerging Issues
The development of our next generation of wildlife professionals is a task taken seriously by The Wildlife Society. This is evidenced by the extensive student outreach performed by the Society and the active nurturing of student chapters. Another important player in providing the educational and experiential foundations to build a competent wildlife professional is the higher-education community. Much of this academic process has been focused on the University-level experience. However, in the era of declining higher education expenditures, cuts have been felt throughout the biology curriculum including cuts to wildlife-related programs and courses. Of particular note are cuts occurring to lower-division courses that often act as “gateway” experiences leading students into a more focused declared major in wildlife. This is where community colleges could provide some of those core competency courses to help springboard students into the wildlife profession. Additionally, by working
with the University community, colleges can provide lower division courses in natural history and fieldwork that highly complement further academic progress in upper division coursework. Surveys of California Community Colleges show that many of these colleges offer courses that meet desired core competencies and provide students with an early entry into the needs of the profession.

**WHITE-NOSE SYNDROME IN BATS: A REVIEW OF THE PROGRESSION OF THE DISEASE AND THE DETECTION CHALLENGES FACING THE WESTERN STATES**

David Wyatt; Sacramento City College - Biology Dept; 3835 Freeport Blvd, Sacramento, CA, 95822-1386; 916-558-2406; wyattd@scc.losrios.edu; Chandra L. Jenkins, Scott D. Osborn and Linda Angerer

**Wildlife Diseases and Pathology**

White-nose Syndrome (WNS) is a rapidly spreading wildlife disease severely impacting hibernating bat populations in the eastern half of North America. Since discovery of affected bats in 2006 in New York and the subsequent naming and describing of the causative agent in 2008, WNS has been found in nine bat species in 21 U.S. States and 4 Canadian Provinces and as far west as Oklahoma. This rapid spread of WNS westward across half the width of North America is unprecedented in a wildlife disease. In addition, the diverse topography of western North America is expected to provide challenges regarding early detection that are likely to be quite different from the experiences from the east. In anticipation of the arrival of WNS into the western states, several states have developed or are in the process of developing planning documents addressing bats and WNS. This paper provides a status review of WNS and the likely response measures developed or being developed by western states.

**ARE THE CURRENT WILDLIFE MANAGEMENT STRATEGIES ADEQUATE?**

**THE WILDLIFE EXCLUSION FENCE: OBSERVATIONS FROM THE FIELD**

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**Urban Wildlife, Management and Emerging Issues**

Wildlife exclusion fence (WEF) implemented in development projects may cause unintended impacts to wildlife. These impacts include habitat fragmentation, isolation, and movement constraints for ground dwelling species such as snakes and frogs. Moreover, impacts to avian species may include injury or death due to in-flight collisions with these fences. Improvements in WEF design have focused primarily on practicality, and the ERTEC Fence (E-Fence) is one such example. The E-Fence consists of a rigid polymer mesh which promotes water and wind flow, but does not incorporate the behavioral needs of wildlife. This particular design creates the illusion of transparency, which appears to cause confusion and subsequent injury or death to snakes, frogs, and birds (including special-status species). We report several incidents of snakes and frogs which were observed attempting to pass through the E-Fence without success. We also include records of birds found dead after colliding with this fence. These field reports presuppose our recommendation for research in fence design prior to its implementation. We believe that species’ behavior, physical capabilities, and variability of habitat are essential components to consider in the design process. Our observations have implications for both wildlife conservation and informed management decisions.
ESTIMATING TREND IN OCCUPANCY FOR THE SOUTHERN SIERRA FISHER POPULATION

William Zielinski; USDA Forest Service; 1700 Bayview Dr., Arcata, CA, 95521; 707-825-2959; bzielinski@fs.fed.us; James A. Baldwin, Richard L. Truex, Jody M. Tucker and Patricia A. Flebbe

Ecology and Management of Large Mammals and Carnivores
The fisher is associated with mature forests in the Sierra Nevada. It is a candidate for endangered status and it is important to monitor its population to evaluate the success of actions to conserve it. We implemented a monitoring program to estimate change in occupancy across a 12,240 km² area in the southern Sierra. Sample units were about 4 km apart, comprised of 6 baited track plates, and aligned with the Forest Inventory and Analysis grid. We report the results of eight years of sampling of 223 core sample units. We modeled the effects of probability of detection and occupancy to estimate occupancy, persistence rates and trend in occupancy. The best-fitting model assumed constant probability of occupancy, constant persistence, and two detection groups. There was no trend or statistically significant variations in occupancy. Positive persistence values suggested that sample units rarely changed status from occupied to unoccupied or vice versa. It is encouraging that the small population does not appear to be decreasing. However, given the habitat degradation that has occurred in forests of the region, we favor continued monitoring to determine whether occupancy increases as land managers implement measures to restore and protect favorable habitat conditions.
Posters
INCORPORATING CLIMATE CHANGE INTO THE CALIFORNIA WILDLIFE ACTION PLAN

Whitney Albright; California Department of Fish and Game; 1416 9th St., Suite 1342, Sacramento, CA, 95814; (916) 653-3611; walbright@dfg.ca.gov; Natalie S. Dubois, Judith Boshoven, Amber D. Pairis and Armand Gonzales

The California Department of Fish and Wildlife (CDFW) has begun the process of revising the California Wildlife Action Plan with a goal of better integrating the impacts of climate change. The CDFW recognizes that climate change is a major challenge to the conservation of California’s natural resources and is taking an active role in planning for and responding to the challenges posed by a changing climate. As part of this effort, CDFW worked with partners to develop a methodology that explicitly integrates climate change into the threat assessment and ratings described in the Open Standards for the Practice of Conservation and will be using this framework to update the California Wildlife Action Plan. This integrated threat assessment provides a basis for identifying climate adaptation strategies that minimize the impacts of climate change on wildlife and habitat. The process will initially be conducted by teams at the ecoregional level and then rolled up into a state-wide strategy. This process provides a systematic and transparent approach to incorporating climate change into conservation planning that is transferable across scales and can be used in a variety of contexts.

DISTRIBUTION OF OBSERVATIONS OF CALIFORNIA RED-LEGGED FROG IN THE GREAT CENTRAL VALLEY HYDROGRAPHIC BASIN

Jeff Alvarez; The Wildlife Project; PO Box 188888, Sacramento, CA, 95818; 209-815-5660; jeff@thewildlifeproject.com; Sarah M. Foster and Jeff T. Wilcox

The California red-legged frog (*Rana draytonii*) was once wide spread through much of California, including the Northern and Southern Coast Ranges, Sierra Nevada foothills, and the Great Central Valley. Today, it is widely accepted that: the species ranges widely through the Northern and much of the Southern Coast Range; still inhabits pockets of habitat in small portions of the Sierra Nevada foothills; is declining precipitously south of Santa Barbara County; and is all but extirpated from the Great Central Valley. Defining these areas can guide our perception of the distribution and persistence of the species in large geographic areas. We are looking at the Great Central Valley hydrographic basin and attempting to determine the current state of occupation of this region by the California red-legged frog. Our definition of the Great Central Valley hydrographic basin includes all river, creek and drainage basins that flow into the Sacramento and San Joaquin Watersheds. Eliminated are any and all watersheds that flow into these systems west of the Highway 160 bridge crossing (Antioch Bridge), between Antioch and Oakley, California. We welcome and request contributions to this effort, which can be added directly to our poster during the poster session.

FALL-WINTER HABITAT UTILIZATION OF EURASIAN WIGEON & AMERICAN WIGEON WITH NOTES ON MIGRATION AND HIGHLY PATHOGENIC AVIAN INFLUENZA H5N1

Jeremy Ashe; California State University, Chico & Burleson Consulting Inc; 950 Glenn Drive Suite 245, Sacramento, CA, 95630; 916-984-4651 X13; ja@burlesonconsulting.com

I studied fall and winter habitat utilization of Eurasian Wigeon (*Anas penelope*) and American Wigeon (*Anas americana*) using time budgets in the Sacramento Valley, California. Habitat utilization by American and Eurasian Wigeon differed only in the proportion of time spent in locomotion and vigilance. Resting, feeding, and locomotion were the top three behaviors exhibited by wigeon (American and Eurasian Wigeon collectively) during each month. Increased feeding by wigeon from November through February suggested an increase in their energetic demands. Seasonally flooded wetlands are important habitats for wigeon, as feeding and resting were
the highest in those habitats. Asymmetric aggressive behavior patterns of Eurasian Wigeon toward American Wigeon suggested these wigeon species may be competing for resources. Additionally, I studied the migration patterns of Eurasian Wigeon and their associations with Highly Pathogenic Avian Influenza Virus H5N1. One Eurasian Wigeon was equipped with a 16g platform transmitter terminal (PTT). I followed this bird’s migration to Central Washington and its daily movements for the final six months. Using all banded Eurasian Wigeon from 1929 to 2010, a map was constructed showing migration routes, stopovers, and a pattern of winter philopatry. In addition, oral and cloacal swabs of eight Eurasian Wigeon were taken, with negative results for H5N1.

HABITAT CONSERVATION PLANS AND CLIMATE CHANGE

Paola Bernazzani; ICF International; 91 Carriage Stone Drive, Chagrin Falls, OH, 44022; 916-501-0921; paola.bernazzani@icfi.com; Bethany A. Bradley and Jeffrey J. Opperman

Habitat Conservation Plans (HCPs) under the Endangered Species Act (ESA) are an important mechanism for the acquisition of land and management of terrestrial and aquatic ecosystems. HCPs have become a vital means of protecting endangered species and their habitats throughout the United States, particularly on private land. The scientific consensus that climate is changing and that these changes will impact the viability of species has not been incorporated into the conservation strategies of recent HCPs, rendering plans vulnerable biologically. In this paper we review the regulatory context for incorporating climate change into HCPs and analyze the extent to which climate change is linked to management actions in a subset of large HCPs. We conclude that most current plans do not incorporate climate change into conservation actions and provide recommendations for integrating climate change into the process of HCP development and implementation. These recommendations are distilled from the published literature as well as the practice of conservation planning and are structured to the specific needs of HCP development and implementation. We offer nine recommendations for integrating climate change into the HCP process.

FALL MIGRATION OF RADIO-TAGGED BROAD-WINGED HAWKS IN CALIFORNIA

Phillip Capitolo; Golden Gate Raptor Observatory; Building 1064, Fort Cronkhite, Sausalito, CA, 94965; (415) 331-0730; phil.capitolo@gmail.com; Lynn J. Jesus, William E. James, Jill A. Harle, Allen M. Fish and Angus C. Hull

In the western United States, little is known about the occurrence and migration patterns of the broad-winged hawk (Buteo platypterus). In California, an annual fall migration by small numbers of broad-winged hawks was documented in the mid 1970s at the Marin Headlands, near San Francisco. From 1986 to 2011, counts ranged from 25 to 248 sightings per season (mean 115 ± 64 SD), but records elsewhere in the state remain sparse. To better understand the habits and flight paths of broad-winged hawks in California, we radio-tracked two juveniles, one in 1994 and another in 2012, from the Marin Headlands to the U.S.-Mexico border. Our study was the first known use of radio telemetry to examine detailed movements of migrating broad-winged hawks. Both birds traveled more than 800 km in four full days of migration, roosting just across the border in Baja California after the fourth day. Flight paths were primarily along slopes of mountain ranges, and were similar for both birds, suggesting possible migratory corridors for broad-winged hawks in central and southern California. Information on migratory corridors in California is critical for raptor conservation given increasing development of renewable energy facilities and their potential direct and indirect impacts on raptors.
SURVIVAL RATES OF PACIFIC COAST BAND-TAILED PIGEONS DETERMINED USING VHF AND SATELLITE TELEMETRY

Michael Casazza; U. S. Geological Survey, Western Ecological Research Center; 6924 Tremont Road, Dixon, CA, 95620; 530-669-5073; pcoates@usgs.gov; Peter S. Coates, Cory T. Overton and Brian J. Halstead

The Pacific Coast population of band tailed pigeons (Patagioenas fasciata monilis) has been in decline since the mid 1960s. Currently, the only population estimates for survival rates were derived from banding efforts primarily during the 1960s and 1970s. The highly migratory nature of this species makes conventional telemetry alone impractical for assessing annual mortality rates. The use of solar powered satellite platform terminal transmitters hereafter PTT’s, on pigeons marked during the breeding season in California, Oregon, Washington and British Columbia, (n=31, 2006-2008) allowed for both seasonal and annual estimates of survival. We compare those estimates to estimates obtained from VHF radio-marked individuals in California (n=54, 1999-2000). We developed an a priori list of candidate models with covariates suspected of affecting band-tailed pigeon survival including body condition, season, sex, and age. No mortalities were observed during a 13-week breeding period and no indication of hunting related mortality was observed. Using ‘RMark’ in Program R we calculated an annual survival rate of 67.8% ± 12.0 (41.0 - 85.4) for PTT marked band-tailed pigeons during 2006-2008. Weekly survival rate was 99.2% ± 0.3 (98.2 - 99.7). The model that included a breeding period covariate was the top model of the a priori set. Derived survival estimates for breeding, fall migration, winter, and spring migration periods were 100%, 87.3%, 91.0%, and 87.1%, respectively for the PTT marked birds. Of 54 VHF monitored band-tailed pigeons, we observed 3 mortalities and found the survival rate during the breeding period (15 June - 07 September) of 1999 and 2000 was 95.0% ± 3.5 (82.0 - 98.7). Lower survival during the winter, and fall and spring migration periods is likely contributing to declining pigeon abundance and future research should focus on those seasons.

ECTOPARASITES ON THE GIANT KANGAROO RAT, CARRIZO PLAIN NATIONAL MONUMENT, SAN LUIS OBISPO COUNTY, CA

Howard Clark; H. T. Harvey & Associates; 7815 N. Palm Drive, Suite 301, Fresno, CA, 93711; (559) 765-8193; hclark@harveyecology.com; Helen K. Pigage, Colin A. Wilkinson and Robert K. Burton

The giant kangaroo rat (Dipodomys ingens) is a keystone species endemic to the San Joaquin Valley of California and adjacent valleys, and is listed by both the State of California and the federal government as “Endangered.” Little is known regarding the occurrence of ectoparasites on giant kangaroo rats. Previous work resulted in the identification of two flea species (Hoplopsyllus anomalus and Meringis californicus) and ticks (Ixodes sp.) on giant kangaroo rats on the Carrizo Plain in San Luis Obispo County, CA (Tabor et al.1993). Two additional flea species, Meringis parkeri and Echidnophaga gallinacea, were observed on giant kangaroo rats during recent trapping efforts within the same geographical location. Fleas and other parasites can potentially have adverse effects on their host species. Identification of fleas and their potential impact on a giant kangaroo rat population is important for the continued conservation of this endangered species.

LANDSAT EVALUATION OF TRUMPETER SWAN HISTORICAL NESTING SITES IN YELLOWSTONE NATIONAL PARK

Laura Cockrell; Eastern Kentucky University; P.O. Box 36, Butte City, CA, 95920; 530-514-3260; lauracockrell@hotmail.com; and Robert Frederick

The trumpeter swan is a bird whose successful recovery has been monitored closely. Lack of quality nesting habitat may be limiting population growth of swans nesting in the Greater Yellowstone Ecosystem. Within
Yellowstone National Park, local drought conditions may be affecting habitat suitability. I used historical nesting information and archived Landsat imagery to map historical nesting locations using ArcGIS (v.10). Historical satellite images were compared to recent images to discern differences between historically and currently used sites, to discern differences in habitat quality between years, and to identify local and landscape level features which change over time. Images were compiled using software tools such as Image Analysis, and images were compared over time using subjective visual estimates (i.e., natural color composites) and objective computer programming (i.e., Normalized Difference Vegetation Index). This technique provides a method for remote assessment of habitat conditions which swans are known to use. The analysis can be used to help managers determine if the habitat is suitable for nesting swans, while archived images provide a long-term monitoring dataset of how habitat conditions have changed. This tool is valuable for future management objectives because mapping programs are flexible and are easily updated when new images become available.

CALIFORNIA TIGER SALAMANDER UTILIZATION OF EXISTING AND RESTORED VERNAL POOLS AT THE ELSIE GRIDLEY MITIGATION/CONSERVATION BANK, SOLANO COUNTY, CALIFORNIA

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The Elsie Gridley Mitigation/Conservation Bank is the largest combined mitigation and conservation bank in the State of California. This approximately 1,800 acre bank is immediately adjacent to the Jepson Prairie and contains a high density of vernal pools that provide breeding habitat for the California tiger salamander (*Ambystoma californiense*). Since 2005, surveys for California tiger salamander have documented recruitment of over 10,000 individuals in approximately 20 breeding locations throughout the bank. In addition, over 60 acres of vernal pools and other aquatic habitats have been restored within the bank since 2005. Furthermore, several of the restored aquatic habitats have been documented as recruitment sites for California tiger salamander.

An additional 36 acres of vernal pool restoration is proposed to occur within the bank during 2014. Lessons learned from the first phases of vernal pool restoration will be presented in this poster along with the conceptual plan for the next phase of vernal pool restoration. Observations made during the first phases of vernal pool restoration will be applied to further increase California tiger salamander recruitment in the newly restored vernal pool habitats.

GIANT GARTER SNAKE (*THAMNOPSIS GIGAS*) HABITAT EVALUATION AND SURVEY AT GRAY LODGE WILDLIFE AREA - A PILOT PROJECT

Lorna Dobrovolny; CA. Dept. of Fish and Game; 1701 Nimbus Road, Rancho Cordova, CA, 95670; 916-543-3659; ldobrovolny@dfg.ca.gov; Dave Van Baren, David Wright, Stacy Heminway and Canh Nguyen

The Giant Garter Snake (GGS) was state-listed as Threatened in 1971 and federally-listed as Threatened in 1993. The United States Fish and Wildlife Service (USFWS) prepared a draft Recovery Plan for GGS in 1999 (USFWS 1999) and a Status Review in September 2006 (USFWS 2006). In 1970, there were 17 known populations of GGS; however, by 1993, only 13 of these populations were extant. The Gray Lodge Wildlife Area (WLA) is located within the range of the Butte Basin GGS population and Sacramento Valley recovery unit. No comprehensive visual or trapping surveys for GGS had been conducted in the Gray Lodge WLA or surrounding properties within the last twenty years, although GGS were observed within the WLA in 1992 and 1997. Using a protocol developed by the U.S. Geological Service, three 50-trap lines were surveyed through the months of August and September, 2012 at Gray Lodge Wildlife Area. This trapping effort yielded 12 new occurrences of...
GGS in a relatively small portion of the wildlife area. A full season of trapping will occur starting in April 2013 to determine species distribution and habitat preferences.

**CONSERVATION OF THE MARBLED MURRELET IN THE PACIFIC NORTHWEST**

**Gary Falxa;** U.S. Fish and Wildlife Service; 1655 Heindon Rd., Arcata, CA, 95503; 707-825-5107; gary_falxa@fws.gov; Martin G. Raphael and Andrew J. Shirk

The marbled murrelet (*Brachyramphus marmoratus*) is a small seabird that forages in nearshore marine waters and nests on limbs of old conifers. The species is federally-listed as Threatened in Washington, Oregon and California. The Northwest Forest Plan provides an ecosystem management plan for ~10 million hectares of federal forest lands in this area, and includes monitoring to evaluate the Plan’s effectiveness in conserving forest species. Monitoring included murrelet surveys in coastal waters from 2000-2011. Results indicate that overall murrelet numbers declined about 2.2%/year during this period. Concurrent modeling of suitable nesting habitat indicated a habitat decline of about 0.5%/year, due mostly to logging on non-federal lands and wildfire on federal lands. The at-sea distribution of murrelets is strongly correlated with amount of adjacent suitable nesting habitat. The population decline could be due to marine conditions and/or losses of nesting habitat. While marine conditions may affect murrelet distribution, analyses to date do not support a marine mechanism for murrelet population declines. Other seabirds with similar foraging ecologies to murrelets did not decline during the same period. Circumstantial evidence suggests that conservation and restoration of nesting habitat are keys to murrelet recovery; while the Plan is helping, recovery is a long-term process.

**COURTSHIP OF NORTHERN PINTAIL IN RELATION TO SEX RATIOS, PAIRING CHRONOLOGY AND HUNTING PRESSURES**

**Stephanie Foster;** California State University, Chico; 400 West 1st St., Chico, CA, 95926; 530-898-5356; sfoster8@mail.csuchico.edu

In studying animal populations of special interest to management, understanding the factors affecting mating and reproduction can be very important. Northern pintail (*Anas acuta*) is a North American duck with population levels that were below projected numbers until recently, and researching some of the mechanisms leading to pairing and mating can help managers regulate the population. In my study, I research a number of different variables and their potential effects on courtship behavior of Northern pintail. To understand trends in changing courtship flight size, I compare this variable to pairing status of females, sex ratios, and hunting pressures over time. From my data, it appears that pairing status, sex ratios, and hunting pressure have no relationship on courtship flight size. It also appears that courtship flight size is random, since it fits a Poisson distribution. This indicates that males join courtship flights randomly, and that none of these factors affect male choice in engaging in courtship flight.

**GENETIC DIVERSITY AND POPULATION STRUCTURE OF THE ENDANGERED CEANOTHUS FERRISIAE (COYOTE CEANOTHUS)**

**Florence Gardipee;** U.S. Fish and Wildlife Service; 2800 Cottage Way, W-2605, Sacramento, CA, 95825; 916-414-6675; flo_gardipee@fws.gov; Rodney Honeycutt, Dan Potter and Janell Hillman

The spatial distribution of the endangered *Ceanothus ferrisiae* (Coyote ceanothus) is limited to three putative populations in Morgan Hill, California. The establishment of eight viable populations is a primary goal of the recovery plan for this plant. We used microsatellite loci and chloroplast DNA (cpDNA) to analyze samples collected from *C. ferrisiae* plants at all three populations. Analysis of microsatellite data in Structure v.2.3.4...
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supported the existence of three populations sampled. Estimates of $F_{ST}$ from the microsatellite data revealed Llagas and Kirby Canyon as the most divergent ($F_{ST} = 0.109$ to $0.175$ and $F_{ST} = 0.134$ to $0.237$, respectively). The highest average allelic diversity ($A_D = 6.00$), and expected and observed heterozygosity ($H_E = 0.58$ and $H_O = 0.54$, respectively) was observed among samples collected from the Llagas Road. The Kirby Canyon population exhibited the lowest genetic diversity ($A_D = 4.36$, $H_E = 0.39$, and $H_O = 0.36$). The cpDNA analyses revealed four haplotypes that formed two major groups: (1) Anderson Dam and Kirby Canyon; (2) Llagas Road. Our study provides evidence in support of the existence of three populations of *C. ferrisiae* and provides information crucial for the conservation and management of this endangered plant species.

**MATERNAL REST SITES: UNIQUE SHELTERS USED BY FEMALE FISHERS REARING KITS**

**Rebecca Green;** PSW Research Station (USFS)/ UC Davis; 54325 McKinley Grove Rd, Shaver Lake, CA, 93664; 559-974-6318; regreen@ucdavis.edu; Kathryn L. Purcell, Craig M. Thompson and Douglas A. Kelt

Male and female fishers (*Martes pennanti*) use a variety of structures as daily rest sites and appear to select sites with characteristics that facilitate physical and thermal protection. Consequently, the selection of an individual rest structure may be influenced by factors like weather, predation risk, or reproductive status. Female fishers are thought to be particularly selective in spring and early summer when choosing reproductive dens, as they rely on these structures to house their vulnerable young kits. Although recent studies have identified rest and den structures used by this rare forest-dwelling carnivore in California, little is known about the structures used by females rearing kits after the denning season. As part of an on-going study of fisher ecology in the southern Sierra Nevada (2008-2012), we documented a unique sub-set of rest structures used by females with kits during the summer and early fall: hollow logs, live trees with low cavities, relatively short snags, and burrows. These maternal rest sites were identified using ground-based telemetry and monitored with remote cameras. We compare characteristics of reproductive dens and rest sites located in our study area with maternal rest sites, describe re-use and behavior patterns, and address conservation implications associated with these sites.

**A REVITALIZATION OF CALIFORNIA DEPARTMENT OF FISH AND GAME’S SPOTTED OWL DATABASE**

**Michael Hardy;** California Department of Fish and Game; 1807 13th Street, Suite 202, Sacramento, CA, 95811; (916) 445-5006; mhardy@dfg.ca.gov

Since 1973, the California Department of Fish and Game has maintained a comprehensive database containing observations of Northern Spotted Owls (*Strix occidentalis caurina*) and California Spotted Owls (*S. o. occidentalis*) throughout the state. It is utilized by regulatory agencies, biologists, consultants, and land owners and managers for project evaluation and mitigation, for species and land management planning, and for research. Although the database currently contains over 115,000 records, the Department lacks up-to-date survey data for many historic owl sites. Furthermore, because survey effort is often sporadic and data submission is largely voluntary, there are some areas within the owls’ known range that are not represented in the database. In 2012, the Department intensified efforts to bring the database up to date, coordinate with state and federal agencies to ensure that regulatory needs are adequately addressed, and improve functionality of the associated Spotted Owl layer within BIOS, DFG’s online Geographic Information System. Here, I provide a brief history of the database’s development, assess the currency and comprehensiveness of the most recent version of the database, and identify gaps in coverage. I also describe recent changes to the presentation and functionality of the BIOS layer and summarize future plans for the database.
GENETIC VERIFICATION OF THE ACCURACY OF A TRACK MEASUREMENT METHOD TO DETERMINE SEX IN FISHER (MARTES PENNANTI).

Sarah Hegg; US Forest Service; PO Box 532, Shaver Lake, CA, 93664; 952-836-8908; sarahjhegg@gmail.com; Jody M. Tucker and Richard L. Truex

The fisher (Martes pennanti) is a forest-dwelling mesocarnivore that is a species of conservation concern on the West Coast. From 2006-2009, the US Forest Service’s Sierra Nevada Carnivore Monitoring Program conducted non-invasive surveys for fisher throughout the southern Sierra Nevada using track-plate boxes fitted with hair snares. The dual detection of fisher via tracks and genetic samples at these survey locations provided us an opportunity to test the method of Slauson et al. (2008) to determine sex using track impressions by comparing the results to genetic sex identification. We analyzed 216 fisher tracks collected from 2006-2009 at 111 sample units that had successfully detected a fisher via genetic sampling. Tracks were assessed for two purposes: 1) assess track quality to determine the proportion of tracks collected that could yield sufficient measurements for use in sex identification, and 2) test the accuracy of sex identification via tracks as evaluated by comparison with genetic data. If proved reliable, using track measurements to determine sex could be used to verify gender in low-quality hair samples, as well as to gain more sex-specific data when fisher are detected at the track boxes, but leave no hair.

SUSTAINED LONG-TERM MONITORING IN MONTANE REGIONS OF NORTHERN CALIFORNIA

Stacy Heminway; California Department of Fish and Game; 1701 Nimbus Road, Rancho Cordova, CA, 95670; 916-358-2929; sheminway@dfg.ca.gov; Canh Nguyen and David Wright

Scientifically based long-term monitoring provides valuable information on distribution, status and trends in plant and animal communities; it informs strategic planning and decision-making for resource conservation, climate change adaptation and mitigation, and resource management. The Ecoregion Biodiversity Monitoring project (EBM) is an ongoing, long-term project coordinated within the California Department of Fish and Game which seeks to provide baseline data and monitor changes in occurrence, distribution, and phenology of wildlife and habitats, and to link changes to climate and land use changes. Our decade long study area currently encompasses 18.7 million-acres throughout the Sierra Nevada, Klamath, Modoc, and Cascade ecoregions of Northern California. Randomized sampling locations within the study area are visited to monitor presence of bird, mammal and plant species, utilizing low-cost, high-return methods such as automated recorders, camera traps, and non-intrusive genetic sampling. Established sampling locations will be revisited every ten years to monitor and assess changes. This presentation provides an overview of the EBM project, including goals and methods, and poster a snapshot of our monitoring to date.

ASSESSING THE DIVERSITY AND RELATIVE ABUNDANCE OF CALIFORNIA BATS IN NORTH COAST VINEYARDS

Rochelle Kelly; UC Berkeley; 2200 University Drive, Berkeley, CA, 94720; 925-360-7413; celllardoor@berkeley.edu; Justin A. Kitzes, Houston Wilson and Adina M. Merenlender

Although 14 species of bat in California are species of special concern, little is known about how human land uses affect bat diversity and relative abundance. We investigated bat activity in 18 Napa and Sonoma county vineyards using acoustic detectors in the summers of 2011 and 2012. At 10 vineyards, detectors were placed both in the vineyard’s interior and adjacent to natural habitat along riparian corridors. Calls were classified using an open source, random forest classifier BatID. Over 481 sampling nights, 17,663 passes were recorded, with Eptesicus fuscus, Tadarida brasiliensis, and Myotis yumanensis comprising 25%, 22%, and 26% of passes, respectively.
Nearly 40% of all activity was recorded at four sites adjacent to riparian corridors, where total activity was approximately twice as high as at paired detectors placed in the vineyard interior. Activity of *Tadarida brasilensis* was found to be highest in vineyard interiors, while activity of *Eptesicus fuscus* was highest at vineyard edges. Our preliminary analysis suggests that the activity of these three relatively common species is highest in vineyards adjacent to natural habitat. Using generalized linear mixed effects models we will evaluate how landscape & environmental variables predict bat activity.

**FALCON DISTRIBUTION IN URBAN AREAS IN THE UNITED STATES**

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Student Poster

Peregrine falcons (*Falco peregrinus*) nearly went extinct due to the widespread use of pesticides, such as DDT. After these pollutants were banned worldwide, and fledgling peregrine falcons were reintroduced in many areas throughout the United States, the population rebounded. However, the species has begun to take up residence in urban areas, in lieu of their more natural cliff aerie habitats. In this study, spatial similarities between the natural habitat and new urban habitat of peregrines were examined using GIS. Analysis showed that urban areas that supported peregrine falcon nest sites generally had a great abundance of either protected open space or water bodies within a 50km radius of nest sites, which is the general habitat characteristics of the peregrine’s natural cliff aeries. This information will help urban planners and conservation planners in making decisions for urban areas with peregrine falcon nesting sites.

**ABUNDANCE ESTIMATES OF BLACKTAIL DEER USING NONINVASIVE SAMPLING IN A GENETIC CAPTURE-MARK-RECAPTURE FRAMEWORK**

*Zachary Lounsberry*; UC Davis, Canid Diversity and Conservation Lab; One Shields Ave/Old Davis Rd, Davis, CA, 95616; 530-754-9088; zlounsbe@ucdavis.edu; Tavis Forrester, Maryjo Olegario, Mark Statham, Heiko Wittmer and Ben Sacks

Estimates of population parameters derived from capture-mark-recapture (CMR) studies have been used to inform management recommendations for species across a wide range of taxa. Several recent studies have focused on molecular assays designed to amplify low-yield, non-invasively sampled DNA to be used in a CMR framework. Here, we present a preliminary estimate of the population abundance in a blacktail deer (*Odocoileus hemionus columbianus*) population in Mendocino County, California. This study demonstrates the utility of a microsatellite assay used to create capture histories from individual genotype profiles based on blacktail deer fecal pellets collected on transects during the summers of 2011 and 2012. After performing rigorous quality control tests, we assigned genotypes to individuals using an identity analysis module in program CERVUS. We estimated abundance using the even capture model (ECM) and two innate rates model (TIRM) in Program CAPWIRE. Preliminary results suggest that our assay can be used to efficiently estimate population abundance using non-invasively sampled DNA from blacktail deer.

**UNDERPASS PERMEABILITY FOR WILDLIFE - HIGHWAY 580, ALAMEDA COUNTY CALIFORNIA**

*Michael Marangio*; Biological Consultant; 5446 Sutter Ave., Richmond, CA, 94804; 510-684-1192; mmar@earthlink.net

Roadways generally act as barriers to movement for many species of wildlife. This issue is of serious concern for wildlife conservation because roadway barriers not only result in mortality from collisions with vehicles, but also restrict dispersal, may limit migration movements, and may prevent genetic exchange. Many existing roadways
include interchanges that have underpasses beneath the roadway that allow permeability of animal movements through (beneath) the roadway barrier. Not much is known regarding the utilization of these structures by wildlife that may offset impacts of roadways to animal movement. A preliminary study was initiated to develop protocols for the documentation of animal movements through an underpass on Interstate 580 in Alameda County where the roadway is 9 lanes wide. Animal track identification using track plates, visual encounter surveys and other techniques provided animal movement data for this underpass that will be used to refine more detailed studies in the future. Further underpass studies provide clues that can be used to improve future roadway designs and to enhance existing underpasses.

AN EVALUATION OF A WEANING INDEX FOR WILD FISHERS (MARTES PENNANTI) IN CALIFORNIA

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Conservation concern for fishers (Martes pennanti) in the Pacific states has highlighted a need to develop cost-effective methods of monitoring reproduction in extant and reintroduced fisher populations. We evaluated the efficacy of nipple size as a predictive index of female fisher reproductive success in weaning at least 1 kit for females with known reproductive histories from three study areas in California. We captured and radio-collared 91 female fishers on 146 occasions between 2004 and 2011 and measured the width and height of all 4 nipples and quantified reproductive success via radio telemetry. We classified each radio-marked female into one of three reproductive classes (non-breeders, attempted breeders, and current breeders) based on our telemetry observations during the den season prior to capture. We used a modified RandomForest (RF) procedure to account for repeated measures of individual females sampled in multiple years. Our modified RF correctly classified reproductive class for 89% and 88% of our 146 observations using raw and weighted vote totals, respectively. We calculated Cohen’s kappa of 0.80 and 0.78 using raw and weighted vote totals, respectively, indicating strong model performance. We conclude that nipple sizes of female fishers measured during a live-trapping effort can be used as a cost-effective index of the weaning rates of adult female fishers.

HABITAT RESTORATION FOR ENDANGERED SPECIES

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Habitat restoration efforts sometimes focus on single species and attempt to isolate problems in time and space. However efforts designed at the community or ecosystem level may be more resilient and adaptable and have a higher probability of long-term success. Several case studies covering a range of habitat types and various rare or endangered invertebrates, fish, amphibians, reptiles, and birds were examined and outcomes evaluated. Two particularly instructive examples included a 1997 proposal in Del Norte County California and a 1987 effort in Humboldt County California which would have managed for one or a few listed species through rigid, labor intensive and expensive command-and-control approaches. Both initially failed to attract scientific, political, or economic support but were later revived by different stakeholders following habitat or ecosystem based strategies which considered natural processes and made allowance for stochastic events. One of these is currently under construction and the other is scheduled and has agency and stakeholder support. Other case studies were designed from the beginning to restore ecosystem processes and some have been completed and proven successful at increasing populations of rare species.
USE OF VIDEO TO EVALUATE HATCH DATE ESTIMATION FOR THE WESTERN SNOWY PLOVER (CHARADRIUS NIVOSUS NIVOSUS)

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Chick banding is often used to estimate fledging success in precocial birds. However, banding precocial chicks requires accurate estimation of hatch dates as chicks are difficult to capture once they leave the nest. Here, we present a pilot study testing the accuracy of two hatch date estimation methods: egg floating and date of clutch completion. We placed video cameras on five nests of the Western snowy plover, a precocial shorebird, breeding on Vandenberg Air Force Base, California. Hatch dates for two nests were estimated using date of clutch completion while the other three nests were estimated by egg floating. All eggs were checked for signs of cracking and pipping on the estimated hatch date. Our results showed that actual hatch dates were 1-2 days earlier than estimates from clutch completion and 2-3 days earlier than estimates from egg floating. All eggs hatched the day after medium to heavy cracking, starring, and/or peeping was observed. Though sample sizes were small, our results illustrate how video cameras can be used to calibrate hatch date estimation techniques. Moving forward, we will increase our sample size of nests monitored with video and develop an index of egg cracking to more accurately estimate hatch date.

DISTRIBUTION OF OAK MISTLETOE IN RELATION TO RINGTAIL HOME RANGES IN THE NORTHERN PORTION OF THE SUTTER BUTTES, SUTTER COUNTY, CALIFORNIA

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The Sutter Buttes are a small volcanic mountain range (ca 200 km²) with a dominant vegetation community of blue oaks (Quercus douglasii) and chaparral. This geological formation is located in the center of the northern Central Valley of California and is one of the largest parcels of undeveloped land in the Central Valley. From 2008-2010, eleven ringtail (Bassariscus astutus) home ranges were determined by D.T. Wyatt and showed consistently small home range sizes (mean = 3.65 ha). A follow-up study of ringtail food habits in 2010 as determined from scat contents (N = 461 scats) found mistletoe to be a significant component of their diet. This poster examines the distribution and abundance of mistletoe relative to the ringtail locations from the home range study.

HABITAT USE OF MULE DEER ON AGRICULTURAL LANDS: IMPLICATIONS FOR SURVIVAL AND REPRODUCTION

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Extensive use of agricultural lands by deer is common throughout the west, especially in desert environments where native forage and water is limited. Artificially high densities of deer on fields can lead to increased disease risk due to close association with livestock and conspecifics, along with nutritional imbalances resulting from a diet primarily comprised of alfalfa. For these reasons agricultural fields have the potential to act as a population sink. We have been monitoring habitat use, survival and occurrence of disease symptoms (diarrhea and emaciation) for deer associated with agricultural fields. We have identified 3 strategies for use where animals will either: 1) remain in the uplands throughout the spring and summer, 2) remain in the uplands through the spring and early summer than transition to the fields during late summer, or 3) remain on the fields throughout the spring.
GREATER SAGE-GROUSE CHICK SURVIVAL AND MOVEMENT PATTERNS DURING VARIABLE CLIMATE CONDITIONS

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Conservation of greater sage-grouse (Centrocercus urophasianus) populations is currently a topic of great concern throughout the western United States. Range-wide declines in sage-grouse populations since the 1950s have been partially attributed to reductions of recruitment into the breeding population. We used flush count data from 2005-2012 from radio-marked female sage-grouse with active broods in Eureka County, Nevada to estimate annual variations in early sage-grouse chick survival. Top models supported a strong positive relationship between pre-fledging chick survival and early spring (May) precipitation, which accounted for 72% of the annual variation in early chick survival. Model averaged estimates of chick survival until 45 days post-hatch ranged from 0.13 (+/-0.03 SE) in the driest spring to 0.40 (+/-0.04 SE) in the wettest spring. Model results supported an interaction between early brood movement and spring precipitation on chick survival that suggested farther brood movements were less deleterious during wetter springs than in drier springs. However, average daily brood movements were two times farther in drier years than wetter years, compounding the negative effects of poor habitat conditions on chick survival. This disparity most likely results from limited optimal brood rearing habitat during drier conditions within our study area.

A STR MULTIPLEX FOR COLUMBIAN BLACK-TAILED DEER

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Noninvasive genetic sampling is a powerful technique for wildlife biologists to identify individuals, estimate population abundance, and determine population origin of unknown samples. DNA can be obtained through a variety of sources such as hair, saliva, shed skin and feces, without having any physical contact or having to observe the animals. However, such noninvasively collected samples yield low-quantity DNA, which requires sensitive assays and replication for accurate genotyping. We developed and optimized a multi-marker panel for Columbian black-tailed deer (Odocoileus hemionus columbianus) composed of 10-12 single-tandem repeat (STR) and a sex-typing marker for use with DNA extracted form fecal pellets. We amplify multiple STR loci simultaneously in a single multiplex PCR assay and discern alleles of different loci using multiple fluorescent dyes attached to primers. Accuracy of this assay and its power to discriminate individuals is quantified. This assay can be used to identify individuals with high confidence from fecal pellets, enabling use in genetic mark-recapture estimation of population abundance. This assay can also be applied to evaluating genetic diversity, estimating familial relationships, and can be used for determination of population of origin to aid poaching investigations.
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PROTECTING THE SAN JOAQUIN KIT FOX THROUGH EXCLUSION IN THE CALIFORNIA VALLEY SOLAR RANCH: A ONE-WAY DOOR DESIGN

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The California Valley Solar Ranch (CVSR) on the Carrizo Plain, San Luis Obispo County, is within the range of the San Joaquin kit fox (Vulpes macrotis mutica), a species protected by both the Federal Endangered Species Act and the California Endangered Species Act. San Joaquin kit foxes use underground dens year-round to escape predators, the harsh conditions of their desert and dry grassland habitats, and to safely raise young. Foxes use several dens throughout the year, moving often. The dynamic nature of kit fox den use creates a constantly changing den landscape that can overlap with solar development and potentially expose kit foxes to the hazards of construction activity. However, reliance on dens also provides an opportunity to quickly discover and protect kit foxes within the CVSR construction footprint through protective buffers. Exclusion through one-way doors temporarily discourages localized kit fox use and retains the den’s structure, making it available for use when construction activities are complete. Here we provide a design for a one-way door currently used at the CVSR project site.

POPULATION GENETICS OF THE FERAL DOGS ON ISABELA ISLAND, GALAPAGOS

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Student Poster

As part of an effort to control introduced species in the Galapagos, feral dogs were eradicated in the 1980s from Isabela Island, where the dogs had occurred independently of humans for ≥150 years. Although their initial introduction was likely by European explorers, translocation by indigenous people from the South American mainland was also a possibility. At the time of eradication, three morphologically distinct and ecologically specialized dog populations occupied distinct portions of the island, suggesting rapid evolution in response to harsh environmental conditions. Whether these populations had become genetically isolated or remained differentiated in the face of gene flow is unknown. We extracted DNA from 92 of the eradicated dogs and used mitochondrial, Y chromosome, and microsatellite markers to determine their origins and to investigate gene flow among the three populations. Both the mitochondrial and Y chromosome haplotypes were most consistent with European ancestry. Microsatellite analysis suggested that the two most remote of the three populations were genetically indistinguishable, indicating high gene flow despite their morphological and ecological differences. The population closest to permanent human settlements also shared many alleles, but exhibited a higher genetic diversity, probably owing to more recent domestic introductions to feral populations.

MIGRATION PATTERNS FOR FLAMMULATED OWLS (OTUS FLAMMEOLUS) FROM BREEDING LOCATIONS IN WASHINGTON, UTAH, COLORADO AND CALIFORNIA USING LIGHT-LEVEL GEOLOCATORS

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Student Poster

Flammulated owls (Otus flammeolus) are small nocturnal owls that are thought to migrate long distances every year from summer breeding grounds in the Western United States to winter habitat in Mexico and Central America. They are cryptic and elusive cavity nesters and little is known about their basic biology including migratory patterns. They have been named a Species of Concern by the U.S Fish and Wildlife Service because of potential habitat destruction. The goal of this research is to track the movements of these owls during their
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migratory season using geolocators. The geolocator records light levels that correspond to sunrise and sunset times to determine specific bird locations. During 2012, 36 geolocators have been attached to male and female owls at field sites in Washington, Utah and Colorado and 25 additional geolocators will be put out in California in 2013. Retrieval of geolocators will occur in 2013-14 and the data will be analyzed to determine owl migration patterns. This geolocator study is the first step in assessing the current status of this species with the goal of a broader western US effort to follow in the future.

BALD EAGLE (HALIAEETUS LEUCOCEPHALUS) MANAGEMENT IN AN URBAN WILDFIRE HAZARD REDUCTION AREA: CHALLENGES & SUCCESSES

David Riensche; East Bay Regional Park District; 2950 Peralta Oaks Court, P.O. Box 5381, Oakland, CA, 94605; 510-544-2319; driensche@ebparks.org; Douglas A. Bell, Mary Malec and Harvey Wilson

The bald eagle (Haliaeetus leucocephalus) is a charismatic member of only about 20 United States species that have been declared recovered and removed from the Endangered Species Act (ESA) of 1973. While being de-listed in 2007 from this fundamentally sound federal law designed to conserve biological diversity and prevent species extinction, they are still protected by the Bald and Golden Eagle Protection Act, and are listed as a California Fully Protected and State Endangered Species. In February 2012, at Lake Chabot Regional Park, a near-urban reservoir located in Castro Valley, California a pair of young bald eagles began building a nest in a eucalyptus grove just outside a fuel treatment area. This event occurred while the East Bay Regional Park District was engaged in eucalyptus thinning to reduce the risk of wildfire along the urban-wildland interface. This presentation highlights the challenges and successes experienced while balancing eagle protect, working with regulatory agencies and other stake holder groups, establishing buffer areas, closing trails, creating public viewing points, implementing stop-work criteria, all while daily monitoring the eagles’ behavior during active vegetation removal and chipping operations which eventually led to the pair triumphantly fledging their single chick shortly after the Fourth of July.

MOVEMENT PATTERNS AND HABITAT USE BY THE WESTERN POND TURTLE (ACTINEMYS MARMORATA) IN THE EAST BAY REGIONAL PARK DISTRICT

David Riensche; East Bay Regional Park District; 2950 Peralta Oaks Court, P.O. Box 5381, Oakland, CA, 94605; 510-544-2319; driensche@ebparks.org; Douglas A. Bell, Amanda L. Dwyer and Janelle A. Dorcy

The western pond turtle (Actinemys marmorata) has been declining throughout its range due to a number of stressors including: habitat degradation and loss, spread of exotic competitors, non-native predators, and epidemic disease. Our only native California turtle is currently listed as a California Species of Special Concern. Through the use of small radio-telemetry devices we tracked the seasonal movement patterns and habitat use of western pond turtles in freshwater ponds that are subject to livestock grazing at Clayton Ranch in eastern Contra Costa County, California. Preliminary research findings showing how western pond turtles use the surrounding landscape for winter hibernation, nest building, and as dispersal corridors to other sites will be shared. This type of new, locally obtained information is critical in maintaining habitat for this special status species. To our knowledge, this is the first long-term research effort on East Bay Regional Park District’s lands to study, manage and implement habitat enhancement projects that are designed to improve conditions for the western pond turtle and support the East Contra Costa County Habitat Conservation Plan and Natural Community Conservation Plan.
**UTILIZING A SPECIES DISTRIBUTION MODEL TO IDENTIFY POTENTIAL HABITAT FOR THE YELLOW-BILLED CUCKOO ALONG THE SACRAMENTO RIVER AND SURROUNDING DRAINAGES**

Matthew Rogers; California State University Chico; Department of Biological Sciences Holt Hall 205, Chico, CA, 95929-515; (530) 680-1261; mrogers8@mail.csuchico.edu; Colleen Hatfield, Don Miller, Raymond Bogiatto, Joe Silveira and Chrissy Howell

Student Poster

Though the yellow-billed cuckoo has a broad geographic distribution in the U.S. it has a limited distribution in the western U.S. and is an endangered species in California. With the potential federal listing of this species, it is important to understand the current range of this species within California and identify breeding sites at a fine scale, taking both vegetation characteristics and various environmental factors into consideration. Along the Sacramento River, surveys indicate site use appears to be dynamic, with a very small number of areas being used year to year. The Sacramento River population also appears to have declined precipitously in the last 5-10 years, which is troubling given the amount of available habitat and the efforts to restore riparian habitat specifically for cuckoos. Using a combination of eBird observations for yellow-billed cuckoos within the last 5 years and Maxent, a species distribution model, potential habitat and species distribution maps were created for the Sacramento River and surrounding drainages which in turn provides insight as to why it continues to decline, as well as to refine survey areas to include all suitable habitat within the region.

**EXAMINING THE RELEVANCE OF RAPOPORT’S RULE IN RELATION TO THE PARASITES OF VOLES (MICROTUS SPP.)**

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Student Poster

Rapoport’s rule of elevation has been used to describe the distribution of species in relation to elevation gradients, but has not often been used to describe parasite distributions. With expected changes in climate due to global climate change, there is a risk of low elevation hosts spreading novel parasites into high elevation zones as their ranges expand. I attempted to examine Rapoport’s rule of elevation and the effect of overlapping host ranges on parasite species diversity. I collected voles at 300 m elevational intervals and identified parasites during necropsy. I found no correlation involving parasite diversity and abundance. While these data suggest that elevation does not have a large effect on diversity or abundance, bias in my sample size may not describe the true diversity pattern in the region. I found a negative correlation between elevation small mammal diversity and I found a negative correlation between elevation and helminth species richness. This suggests that elevation has a negative effect on helminth species presence. Other factors such as temperature, host dispersal patterns, and differences in microhabitat should be further explored to understand the distribution of parasites in northern California.

**STRUCTURAL AND FUNCTIONAL CHANGES OVER TIME AT FISHER (MARTES PENNANTI) REST STRUCTURES IN NORTHWESTERN CALIFORNIA**

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Resting habitat used by fishers (Martes pennanti) has been relatively well studied but information on the persistence of their resting structures over time is scarce. We looked at 75 rest structures used by fishers in northwestern California, and compared their condition on the date they were found with their condition 8.7 to 13.1 years later. Resting structures fell into five functional groups: live trees, snags, platforms, logs, and ground cavities. Structural changes occurred in 16% of structures between initial discovery and description and
reexamination. For example, 3% of snags became logs during the study. We specified the functional state - usable or unusable - of each structure group (e.g., a useable cavity in a snag would become unusable if the snag collapsed). Changes in functional state within this short time frame were rare; we judged that < 10% of resting structures became unusable due to natural processes over the ~10-year period. Continued monitoring in the future, either of the same structures or structures with similar characteristics, will help us gauge net changes in the abundance of these important fisher habitat features. Such changes may occur due to a combination of natural and anthropogenic causes.

CHARACTERIZING MIGRATION PATTERNS, WINTER HABITAT AND DIET OF NORTHERN SAW-WHET OWL (AEGOLIUS ACADICUS) IN THE SIERRA NEVADA FOOTHILLS OF CALIFORNIA

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Northern Saw-Whet Owls (NSWO, Aegolius acadicus), a small raptor species, migrate in large numbers every fall from Northern latitudes, including through the Sierra Nevada Foothills above Chico. Recent efforts to characterize their migration and destination using mist-netting and radio-telemetry techniques revealed that some NSWO overwinter locally at BCCER, while others continue migrating to yet unknown winter habitats. This study’s goal is to identify critical winter habitat and prey of NSWO in the Sierra Nevada foothills and more specifically at BCCER by radio-tracking individuals to their diurnal roost sites, assessing the vegetation they are using, comparing usage to randomized vegetation plots, and analyzing their pellets for prey species. From two seasons of radio-tracking sixteen NSWO to 137 roost sites, this study has revealed a preference for Canyon live oak (Quercus chrysolepis) and Toyon (Heteromeles arbutifolia), with roosts averaging 11.8 (+/-9.57) meters when in Q. chrysolepis, and 1.36 (+/- .64) meters in H. arbutifolia. Preliminary diet analysis shows a majority of pellets containing remains from multiple individuals, including Reithrodontomys megalotis, Microtus californicus, and Peromyscus species. This is one of very few in-depth habitat studies for Saw-whet owls in California, and will provide critical information for habitat managers on local reserves.

SAVING LIVES AND TRAINING THE NEXT GENERATION: STATE ROUTE 101 WILDLIFE CORRIDOR SAFETY PROJECT

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State Route (SR) 101 north of San Luis Obispo, California is a major regional highway with weekday traffic volumes of 4,000 vehicles/hr. SR101 also bisects a major wildlife corridor near the Los Padres National Forest, leading to increased animal-vehicle collisions (AVC) involving black bears, mule deer, and mountain lions. To develop solutions, Caltrans initiated an ongoing collaboration with California Polytechnic State University (CPSU) in San Luis Obispo. Starting in 2009, CPSU students used automatic camera stations, trackplates and daily drive surveys to document wildlife roadkills, roadside activity and use of existing underpasses for a wildlife study associated with a proposed median barrier project. Results from this study guided design decisions for the development and construction of a 2.5 mile wildlife exclusion fence in a roadkill hotspot located in the same area. The 8-foot wire mesh fence guides wildlife safely to existing undercrossings. It also includes four electromats at unfenced roadway intersections to prevent bears from entering the roadway, as well as four jump-out ramps to allow deer and other wildlife to escape from the road corridor. Post-construction surveys began in summer 2012 and CPSU students are currently monitoring the fence’s effectiveness at reducing roadkills while maintaining regional wildlife connectivity.
WHAT MATTERS TO A MOUSE? HABITAT PREFERENCE IN ZAPUS PRINCEPS

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Several jumping mouse species, including the threatened *Zapus hudsonius preblei* and *Zapus princeps*, are common in riparian habitat. There are multiple hypotheses (need for water, food type, or cover) for why this is. In this study I examined *Zapus princeps* (western jumping mouse) habitat preference on a fine-scale in the East River Valley, Gunnison, CO. I compared live-trap success rates in three different habitats (riparian, intermediate and dry) occurring within a 40-meter wide area. I marked the mice uniquely to indicate the habitat in which they were first trapped. I compared trapping success between two different microhabitats (wet/cover vs. dry/cover) to investigate why *Zapus* prefers mesic areas. I also used historical trapping records on permanent grids to determine long-term patterns of *Zapus* captures with vegetation and proximity to water. *Zapus princeps* was captured more frequently in riparian areas. *Zapus* preferred to move within and between wetter habitats. The historical study found a negative relationship between trap success and distance from water. There was a trend but no significant difference in captures between microhabitats. These results offer further understanding into the ecology of *Zapus* and riparian habitat.

CONDITIONS INSIDE FISHER DENs DURING PRESCRIBED FIRES; WHAT IS THE RISK OF SPRING UNDERBURNS TO FISHERs AND THEIR KITS?

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Risks to wildlife from exposures to heat and gases during wildland and prescribed fires are generally unknown, creating uncertainty for managers as they balance the risks of direct effects against long term benefits to habitat. In the southern Sierra Nevada, spring underburns are a preferred method for fuel reduction yet the application has been restricted due to perceived risk to denning fishers. Preference is given to mechanical fuel treatment despite the potential ecological benefits of fire and the fact that there has been no systematic evaluation of risk or potential mitigation strategies. To begin evaluating the risk of spring underburns to denning fishers and their kits, we equipped seven historic fisher den sites with temperature and carbon monoxide dataloggers during spring 2012. Quarter to half-acre plots around each den were subsequently burned. In all seven dens, temperatures inside the cavity remained remarkably stable throughout the fire despite high fluctuation in outside temperatures. In one den, carbon monoxide levels briefly reached a concentration potentially hazardous to fisher neonates. Additional data on the true risks of prescribed fire to fishers is sorely needed in order to identify situations and prescriptions where prescribed fire can safely be used.

DESIGN OF ARTIFICIAL BURROW AND ENCLOSURE USED TO RELOCATE GIANT KANGAROO RATS AT THE CALIFORNIA VALLEY SOLAR RANCH

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Development of the California Valley Solar Ranch (CVSR) on the Carrizo Plain, San Luis Obispo County, includes some unavoidable impacts to giant kangaroo rats (*Dipodomys ingens*), a species protected by both the federal Endangered Species Act and the California Endangered Species Act. The U.S. Fish and Wildlife Service and the California Department of Fish and Game have recommended that in addition to modifying the project design to minimize impacts to the species, unavoidable impacts should be mitigated in part by developing and implementing a program to relocate giant kangaroo rats from impacted areas of the project site to suitable
unoccupied areas of the project site that will be managed in perpetuity for conservation of giant kangaroo rats and several other species. A central component of the relocation program is a soft-release artificial precinct enclosure that provides shelter, food, and an opportunity for the relocated animals to establish new burrow precincts. Here we provide the specifications of the artificial burrow and enclosure design that has been successfully implemented in the relocation of giant kangaroo rats at the CVSR project site.

**Bat Activity in the Northern Portion of the Sutter Buttes as Determined by Long-Term Acoustic Data, Sutter County, California**

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The Sutter Buttes are a unique geological formation in the Central Valley of California that provides extensive contiguous natural habitat for many mammals including bats. Long-term acoustic monitoring using solar-recharged Anabat detectors has been continuously occurring since 2011 in multiple locations in this small mountain range. Bat activity levels in 1-hr blocks after sunset was calculated for a period of 1-yr to determine peak activity levels on a monthly and one year basis from multiple sites and habitat types in the Sutter Buttes. As expected, peak activity levels were experienced shortly after sunset with gradual peaks and declines throughout the night.

**Bird Mortalities in Open Pipes**

**Mary Whitfield**; Southern Sierra Research Station; P.O. Box 1316, Weldon, CA, 93283; (760) 378-3345; mjwhitfield.ssrs@gmail.com; and Sean P. Rowe

Hollow metal and plastic (PVC) pipes and posts are found throughout the world and serve a variety of purposes. Wildlife (birds, reptiles, small mammals) mortalities, including species of conservation concern, have been documented in mine claim marker posts (Brattstrom 1995, Lahontan and Red Rock Audubon Societies 2009) which resulted in a Nevada law that called for the removal of all PVC mine claim markers across the state (American Bird Conservancy 2011). However, wildlife mortalities in pipes (death pipes) are not limited to uncapped mine claim marker posts. In 2009, we found a fallen irrigation stand pipe which contained the remains of over 200 dead birds. Since then we have documented a large number of vertical open-topped pipes with dead birds. At least 45 species of birds along with several other vertebrate species have been found dead in pipes. We will give examples of numerous uses of open-top pipes and will present information on solutions to prevent this problem.

**Investigating Geographic Isolation in the Sutter Buttes Using Comparative Northern Pacific Rattlesnake Venom Proteomics**

**Glenn Woodruff**; CSU Chico; 1524 #1 Boucher St., Chico, CA, 95928; 925-212-7245; glenntwoodruff@gmail.com; Tag Engstrom, Daniel Edwards and Colleen Hatfield

Geographically isolated habitat is of special concern due to the potential for speciation or extinction over time. Sutter Butte State Park of northern California represents unique possibilities for studying geographic isolation. The location of this mountain range is peculiar because it stands alone in the northern Sacramento River valley, surrounded by flatlands in all directions. These contrasting habitat types could deter animal migrations to and from the Sutter Buttes, creating isolated populations. Instances of geographic isolation in this range have already
been documented, including the sagebrush lizard whose population in the Sutter Buttes exists well below the expected elevation for this species.

My research will utilize venom protein characteristics to determine whether the northern Pacific Rattlesnakes (*Crotalus oreganus*) of Sutter Buttes are geographically isolated. These venom characteristics have been shown to adapt to environments relatively rapidly. By identifying differences in venom protein abundance or composition between populations, it is possible to discover how closely linked populations are. My research will use a method of chemical analysis to determine if and to what degree these snakes are isolated.
Plenary
Abstracts for Plenary Presentations Sorted Alphabetically by Author

**DOES CITIZEN PARTICIPATION IMPROVE THE ESA’S LISTING PROCESS?**

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**Abstract:** One of the more controversial provisions of the Endangered Species Act is citizen involvement in selecting species that become formally protected under the law (“listing”). Citizens can petition the U.S. Fish and Wildlife Service (FWS) to list any unprotected species and can independently use litigation to challenge any FWS listing decision. Critics have argued that these provisions interfere with the ability of FWS to prioritize scarce resources for species that most need protection, and that citizens use petitions and litigation to pursue “pretextual” listing of species to stop development projects, including the strategic use of the listing of subspecies and populations for protection under the Act. We compared the levels of biological threat faced by listed species whose listing process was initiated by petition, or whose listing process had been the subject of litigation, with species whose listing process was neither initiated by petition nor was the subject of litigation. We relied on FWS’s own assessments of biological threat, drawn from the agency’s recovery priority rankings data. We found that petitioned and/or litigated species faced higher levels of biological threat than species that were the subject of neither petitions nor litigation. We did find that citizens were more likely to petition and litigate for the listing of species whose conservation would conflict with development and for the listing of subspecies and populations. However, listed species whose conservation conflicts with development also face greater threat levels than species whose conservation does not conflict with development; subspecies do not face systematically higher levels of threat than full species. Our results indicate that citizen petitions and litigation may help improve the ESA listing process, at least in terms of identifying species that warrant protection under the Act.

**Biography:** Eric Biber’s teaching and research interests are environmental and natural resources law, administrative law, and property. Prior to joining Berkeley in 2006, he worked as a litigator in the Denver office of EarthJustice, a public-interest nonprofit organization specializing in public lands and other environmental cases. Biber earned a master’s of environmental science with a focus in conservation biology from the Yale School of Forestry & Environmental Studies and a J.D. from Yale Law School. Biber’s scholarship has appeared in a wide range of journals, including *Science*, *Frontiers in Ecology and Environment*, *Society and Natural Resources*, the *University of Chicago Law Review*, the *UCLA Law Review*, *University of Colorado Law Review*, and *Harvard Environmental Law Review*. At Berkeley, Biber teaches courses in Property, Public Lands and Natural Resources Law, Biodiversity Law, and Environmental Law and Policy.

**CRYING WOLF IN THE LISTING AND DELISTING OF SEABIRDS**

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**Abstract:** The barriers to delisting the “endangered” Brown Pelican (*Pelecanus occidentalis*) from the federal and California endangered species acts’ (ESA) lists were almost insurmountable. Despite abundant scientific evidence that the species was no longer in danger of extinction, it took separate petitions to delist from the state and federal lists, a grueling 4-year administrative process, and a $100,000 environmental assessment. The California population met or exceeded historical levels and had maintained an upward population trajectory for decades. The Center for Biological Diversity petitioned to list the Black-footed Albatross (*Phoebastria nigripes*) despite the fact that publicly-available data showed increasing populations or stability at major breeding sites. Treat arguments based on DDE and PCB threats utilized poor science. Pending petitions to list the Ashy Storm-petrel (*Oceanodroma homochroa*) and Kittlitz’s Murrelet (*Brachyramphus brevirostris*) are controversial because population estimates are notoriously imprecise. Ambiguity is the real basis of many listing petitions and often a line is drawn by listing aficionados between a cherry-picked high and low population estimate to “prove” an impending calamity. Listing has become a “gotcha” exercise that often does not advance conservation. Excessive
litigation is ceding wildlife management to judges and ignores that all birds already have substantial protections under the Migratory Bird Treaty Act.


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**THE ENDANGERED SPECIES ACT - WILL IT LAST ANOTHER 40 YEARS?**

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**Abstract:** I will give a brief rundown of the evolution of Earth Day, 1970, the defeat of the seven of the “Dirty Dozen” by the Earth Day kids, and the enormous heyday of environmental legislation which was enacted between 1971 and 1974. This includes enactment of the Clean Air, Clean Water and Endangered Species Acts and the Coastal, Estuarine and Marine Mammals Protection Acts, all accomplished by bi-partisan cooperation between the Congress and President Nixon’s environmental person, John Ehrlichman. A review of the first 40 years of the ESA would not be complete without an assessment of the it prospects to reach 40 years.

**Biography:** Mr. Paul N. “Pete” McCloskey, a life-long environmental attorney who also specializes in representing landowners in condemnation actions, graduated from Stanford Law School in 1953. He served as President of the Palo Alto Bar Association and the Conference of Barristers of the State Bar, as Trustee of the Santa Clara Bar Association, and has taught at Stanford University, Santa Clara University, the Army War College and the Marine Corps Staff College. Mr. McCloskey received the Navy Cross, Silver Star and two Purple Hearts as a Marine Rifle Platoon leader in the Korean War. He was elected to the House of Representatives in 1967, and was re-elected seven times, representing the San Francisco Peninsula area, including Silicon Valley. Mr. McCloskey served, as Co-Chairman of the first Earth Day in 1970 and ran for the Republican nomination for the Presidency in 1972, challenging President Nixon’s Viet Nam War policy. In the House of Representatives Mr. McCloskey served under Chairman John Dingell on the Subcommittee on Fish and Wildlife Conservation, where language for the Endangered Species Act was crafted in 1973. In Mr. McCloskey’s own words “We all had a hand in a bi-partisan agreement on the language, not dreaming it would have the impact it has had over the past 40 years.” Mr. McCloskey has also been a Congressional Delegate to the International Whaling Conference and a Congressional Advisor to the Law of the Sea Treaty Delegation. He was appointed by President George H.W. Bush to the U.S. Commission on National and Community Service in 1990, confirmed by the Senate and elected as its first Chairman. In 2006, Mr. McCloskey came out of retirement to challenge Congressman Richard Pombo in the Republican Primary in California’s 11th Congressional District. In 2007 Mr. McCloskey became a Democrat. He has written three books, *The U.S. Constitution*, (BRL, 1961); *Truth and Untruth*, (Simon & Schuster 1971); and *The Taking of Hill 610* (Eaglet Books, 1992). He was also the chief editor of *Guides to Professional Conduct for the New Practitioner* (State Bar, 1961). Mr. McCloskey’s hobbies include backpacking, fly fishing and military history.
THE ENDANGERED SPECIES ACT (ESA) - IMPLEMENTATION, CHALLENGES, PARTNERSHIPS, AND COLLABORATION

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Abstract: ESA implementation involves the hard work of meeting the Act’s legal mandates while being pushed by stakeholder litigation, pulled by oft-conflicting court decisions, supportive of National priorities, and constrained by budget realities. We are challenged with conserving increasing numbers of imperiled species in the face of mounting threats and a growing human population. In the face of biological and legal uncertainties, we nonetheless must make listing decisions and develop recovery strategies for listed species, including those threatened primarily with climate change. While the number of species removed from the List of Threatened and Endangered Species through their recovery is modest, the ESA has been tremendously successful at keeping species from going extinct and improving their conservation status. Future success will come as a result of continued and increased partnerships and collaboration, and increased emphasis on landscape-level conservation strategies.

Biography: Alexandra (Alex) Pitts has been serving as the U.S. Fish & Wildlife Service’s Deputy Regional Director of the Pacific Southwest Region (Region 8) since 2010. She plays a lead role in ensuring the Service’s mission and goals are met at 50 national wildlife refuges, 11 fish and wildlife offices, and three national fish hatcheries in California, Nevada, and southern Oregon. Region 8 also administers the Endangered Species Act and has lead management responsibilities for 292 threatened and endangered species. Ms. Pitts began her career with the U.S. Fish and Wildlife Service in 1998, serving as the Service’s Chief of Congressional and Legislative Affairs in Washington, D.C. In 2004 she came to the Pacific Southwest Region (formerly California and Nevada Operations) where she served as Assistant Regional Director of External Affairs for nearly 6 years. Prior to her career with the Service, she worked as a lobbyist for the Weyerhaeuser Company. She also spent nearly seven years on Capitol Hill working at various times as a legislative assistant to Oregon Congressman Michael Kopetski, legislative aide to Oregon Senator Ron Wyden, and as a staff member on the House Agricultural Committee. Ms. Pitts has an undergraduate degree in geography and botany and a Masters in Forestry. She and her family enjoy spending time hiking, kayaking and skiing.

REVISING THE ENDANGERED SPECIES ACT

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Abstract: A discussion on the legislative efforts to reform the Endangered Species Act, past present and future. The need to protect private property rights within the implementation of the law is the key to successfully protect and enhance habitat for the recovery of sustainable populations of endangered and threatened species. Future revisions of the ESA must acknowledge the problems and solutions that in the field biologists and those directly involved with species recovery have expressed. The agencies must have the resources available to them to make decisions based on science and the law.

Biography: Richard Pombo, a rancher from the Central Valley of California, was first elected to the US House of Representatives in 1992 and represented California’s 11th district until January of 2007. While a Member of the House he served on the Transportation Committee, the Merchant Marine and Fisheries Committee, the Agriculture Committee and the Resources Committee. Mr. Pombo was an especially active member with his career culminating with service as the Vice-Chairman of the Agriculture Committee and Chairman of the Resources Committee. He was the key author of several pieces of legislation including reforms to our nation’s environmental laws, energy policy, Native American and Tribal issues, Farm Bill legislation, transportation and
international policies. Mr. Pombo also served as the Co-Chair of the Speakers Task Force on Affordable Natural Gas, is a past Chairman of the Western Caucus, and was a Co-Founder of the Portuguese-American Caucus. Mr. Pombo’s work on the protection of private property rights led him to author the widely reviewed book This Land is Our Land and to be a staunch defender of property rights on Capitol Hill. Mr. Pombo splits time between his ranch in California, where he and his wife, Annette, have raised their three children, and Washington DC.

THE ESA AT 40: A SUCCESSFUL PAST AND AN UNCERTAIN FUTURE

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Abstract: In its seminal 1978 decision in *TVA v. Hill*, the U.S. Supreme Court called the Endangered Species Act “the most comprehensive legislation for the preservation of endangered species ever enacted by any nation.” Over four decades, the statute has succeeded in halting and reversing the declines of many species on its protected lists. Its requirements for federal agencies have made species conservation an integral element of agencies’ planning and decision-making, and the law’s substantive prohibitions – or merely the possibility of these prohibitions in many cases – have led to notable progress in protecting habitat on private land. The statute may be showing signs of age, however. Methodological problems in assessing whether federal actions may jeopardize listed species or destroy critical habitat threaten to allow “nickel and dime” impacts to slowly drive species toward extinction. Lack of consensus in defining key concepts such as which populations are eligible for protection and what constitutes species recovery further undermine conservation efforts. Enforcement of the law, particularly on private land, is sporadic at best. The law faces its stiffest test in confronting twenty first century threats to biodiversity, such as impacts stemming from invasive species and climate change. Designed in 1973 primarily to combat project-based threats to individual species, the ESA has thus far largely floundered in addressing more pervasive and systemic conservation challenges. Ultimately, two factors will determine whether the United States will remain a leader in protecting species from the unprecedented challenges posed by the modern world: elected leaders and agency managers must be willing to update and enforce the ESA, and the American public must be willing to live within the limits of the ecosystems that all living things must share.

Biography: Professor Dan Rohlf teaches in Lewis and Clark Law School’s nationally known environmental and natural resources law program. He also works on real-world environmental litigation as a cooperating attorney with Earthrise Law Center, Lewis and Clark’s environmental law clinic. Originally trained as a geologist, Dan’s expertise lies in endangered species law and policy, wildlife law, and ecosystem management. He is also interested in the interaction of law and science. Classes he teaches include “Wildlife Law,” “Law, Science, and the Environment Seminar,” “Sustainability in Law and Business,” and a summer field course for law students called “Legal Ecology.” His caseload at Earthrise also focuses primarily on endangered species issues, including extensive work on restoration of salmonids in the Columbia River Basin. Dan’s research and publications likewise have centered on conservation of biological diversity. He is the author of *The Endangered Species Act: A Guide to Its Protections and Implementation*, which won the National Wildlife Federation book award. He has lectured and published widely on topics related to protecting and managing biodiversity. Dan received his B.A. degree in geology from Colorado College and his J.D. from Stanford. After law school he served as a clerk for Justice Jay Rabinowitz of the Alaska Supreme Court.
ON TIME, ON TARGET: HOW THE ENDANGERED SPECIES ACT IS SAVING AMERICA’S WILDLIFE

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Abstract: Critiques of the Endangered Species Act have focused on the fact that only 1% of listed species have recovered and been delisted. This begs the questions: how many should have recovered by now? What is the standard for establishing recovery expectations? Reviewing the recovery time projection in all federal recovery plans, all downlisting, delisting and status reviews by the U.S. Fish and Wildlife Service and the National Marine Fisheries Service, and annual population trends for over 100 species, we determined that 1) the vast majority of listed species are not scheduled to reach recovery goals yet, 2) the majority of species are progressing toward (=increased population size since listing), and 3) recovery rates generally accord with those established in recovery plans. We conclude that the Endangered Species Act is working well to both avert extinction and move species toward recovery.

Biography: Kieran Suckling is the founder and executive director of the Center for Biological Diversity, an endangered species protection group initiated 1989. He has bachelors and masters degrees in Philosophy and started the Center while writing a doctoral dissertation on the relationship between the loss of biological and linguistic diversity. He has published numerous articles on the political history and effectiveness of the U.S. Endangered Species Act.
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